

# Into the woods

Overlapping perspectives  
on the history of ancient forest

Sandrine Paradis-Grenouillet,  
Chantal Aspe, Sylvain Burri, editors

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# Into the woods

## Overlapping perspectives on the history of ancient forests

SANDRINE PARADIS-GRENOUILLET, CHANTAL ASPE AND SYLVAIN BURRI (EDS.)

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# Chapter 7: On the ecology of ancient and recent woodlands: the role of the historical approach

Roberta Cevasco, Carlo Montanari and Valentina Pescini

This chapter presents several Italian case studies to interpret and discuss the concept of ancient forests by means of methods and sources used by historical ecology. The concept and definition of ancient forest has been largely discussed in UK by the Historical Ecology Discussion Group (HEDGE) since the late 1960s in a series of seminars hosted at the Huntington Institute of Terrestrial Ecology. This was followed in 1976 by Oliver Rackham's book *Trees and Woodlands in the British Landscape*, published in the "Archaeology in the Field Series". In 1980, Rackham's book *Ancient Woodland: its history, vegetation and uses in England* inspired nature conservation policies in British ancient woodlands (Rackham, 1976, 1980; Arnold, 2016).

Recently, the debate in continental Europe about the role of the historical approach in ecology has neglected these English works, favouring instead American historical ecology. Moreover, scholars have widely focused on the French *Annales E.S.C.* tradition rather than on British local history (Hoskins, 1955), an approach based on multiple historical sources that was the background of the HEDGE historical approach in the study of ecosystems (Cevasco and Moreno, 2015).

The historical approach adopted by the Laboratory of Environmental Archaeology and History (LASA) of the University of Genoa involves the use of multiple sources (textual, geographic, archaeological, ethnologic, oral, environmental), a regressive method and strong spatial and social contextualization. In fact, the methods of British historical ecology (*sensu* Oliver Rackham) have been developed by reworking and comparing contents of British local history with those proposed by the Italian microhistory (Grendi, 1996; Raggio 2004).

This analytical historical approach has been used in discussing the interest of

microhistorical-geographical sources (Cevasco, 2007). The sedimentary and observational sources generally related to woodland environmental archaeology are now more generally produced and analysed as part of an archaeology of environmental resources (Pescini, 2018).

The strengths and weaknesses of this approach will be illustrated through two selected case studies concerning the history of Mediterranean multi-use systems of woodland resources (agrosilvopastoral). The first case study pertains to a mountain area (Upper Trebbia-Aveto Basin) while the second is on the coast of western Liguria (Merula Valley, north-west Italy; Figure 7-1).

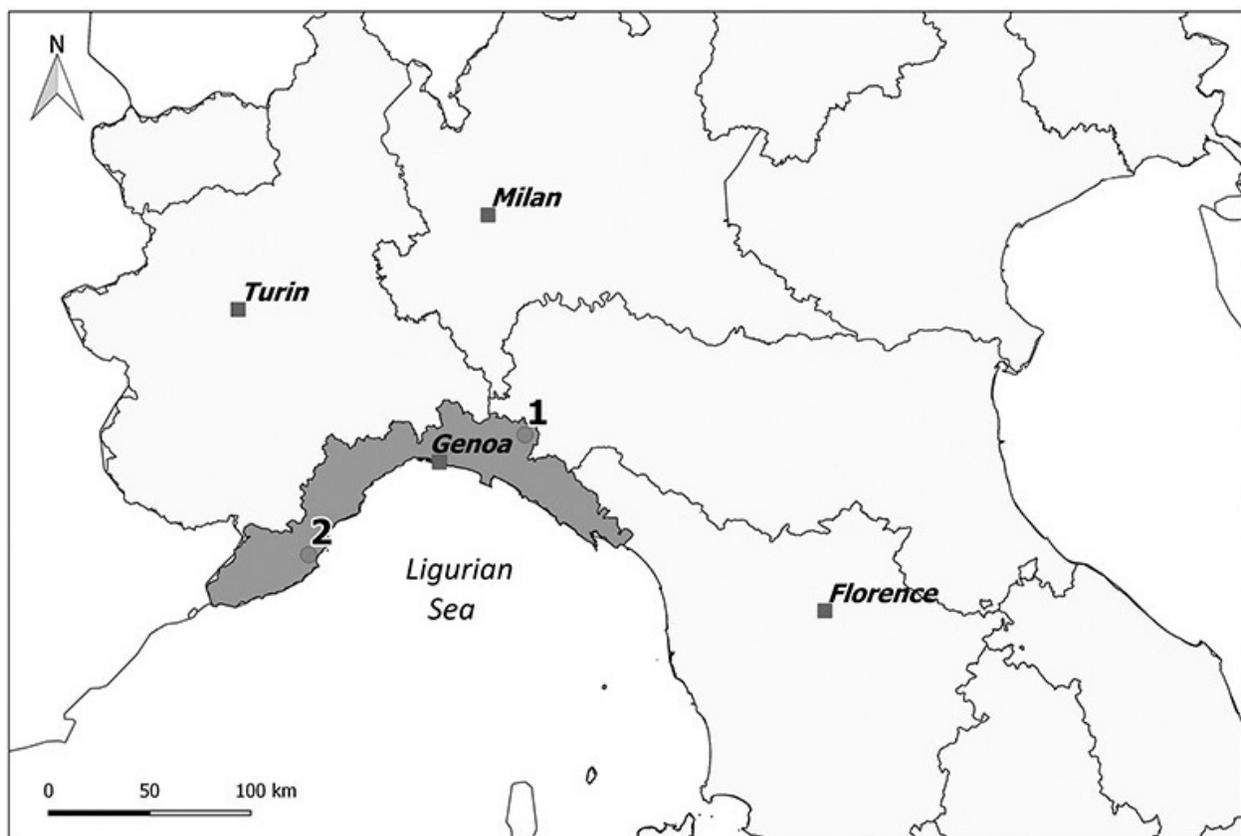


Figure 7-1: Location map of Upper Trebbia-Aveto Basin (1) and Merula Valley (2).

Sedimentary, observational, cartographic and textual sources have been used to characterize the state of ancient forests (*Quercus cerris* woodland in Upper Trebbia-Aveto Basin in the north-western Apennines) and recent forests (woody neo-formations) growing on former pastures and meadows bearing *Pinus pinaster* and *Pinus halepensis* standard trees in the Lower Merula Valley in the coastal area of the western Riviera.

When textual and iconographic sources at topographical scale are not found for an ancient time period (e.g., over 250-300 years) we can look to biostratigraphic archives (soil, sediments, preserved biologic remains). Going backwards with a regressive analysis, we assume that a continuity of pollen deposition recorded at sampling sites can prove continuity with the present living population of several species at the study site (see the Trebbia-Aveto site). This approach resulted in a regressive history of the site ecology and a more defined environmental content of the surrounding ‘individual landscape’ (Pescini *et al.*, 2018; Molinari and Montanari, 2016). As we will show in the following case studies, this approach can be very helpful in ascertaining the difference between ancient and recent forests. Moreover, in the Mediterranean (both in mountain and coastal areas), we considered an ancient forest with a tree population with more than 200 years continuity (*sensu* O. Rackham), demonstrated by land-use continuity recorded in historic documents and cartography. By contrast, a recent forest, as we will show in the Merula Valley example, has a living tree population with a minor (e.g., decennial) continuity, growing at a site with documented land-use discontinuity.

## Upper Trebbia-Aveto Basin: Lago di Rezzo

A recent vegetation map ( De Rigo *et al.*, 2016) shows an irregular diffusion of *Quercus cerris* in Europe in comparison with its assumed native distribution. The high frequency of occurrence in the Balkan and Italian Peninsulas has been associated with the past use of acorns and foliage as a pastoral resource (Praciak *et al.*, 2013; De Rigo, 2016). Turkey oak was an important tree in the northern Apennines in the context of local multiple tree-land systems (Cevasco, 2004). However, the historical dynamics of these oak populations remain largely unknown. The present (AA. VV., 2006) western distribution in Liguria, for instance, shows only two small populations in the Upper Bormida Valley that are generally included in the Illirian oak-hornbeam forest phytosociological group. Even so, in medieval documents *Quercus cerris* is mentioned extensively in central and western Liguria and there is rich place-name evidence of its past presence. Currently this species is characteristic of many woodland areas, especially in the eastern part of the region.

Our research provides new information that is useful in understanding the past role of Turkey oak in the mosaic of specific local multiple tree-land systems (Cevasco, 2004) that have shaped the eastern Ligurian landscapes.

A project devoted to the study of wetland habitats considered to be biostratigraphic archives for the study of environmental resource archaeology allowed us to localize a number of unrecorded sites in this section of the Ligurian Apennines (Guido *et al.*, 2013). The Lago Rezzo site (Rezzoaglio – Upper Trebbia-Aveto Basin) was cored and a pollen diagram was produced (Cevasco, 2013; Figure 7-2).

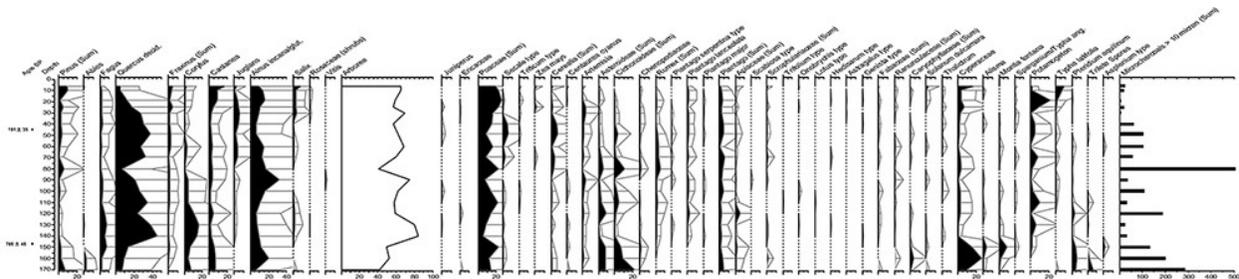


Figure 7-2: Upper Trebbia-Aveto Basin (Lago di Rezzo, Rezzoaglio) pollen diagram showing postmedieval (ca. 1750 AD) and medieval (ca. 1300 AD) phase of *Quercus* pollen expansion (Cevasco, 2013).

The diagram provides evidence on a local scale of two main medieval and postmedieval phases of oak tree/woodland expansion on the slopes of this small lake basin situated at 779 m asl (Cevasco, 2013); we will briefly discuss this evidence with reference to a number of possible environmental indicators (Table 7-1) and historical sources. Two radiocarbon dates at depths of 45 cm and 145 cm provide an initial chronology for the core (in this text and in the diagram approximated as ca. 1750 AD and ca. 1300 AD).

In the diagram discussion, by means of the abovementioned regressive approach, the postmedieval phase has been interpreted as covering the whole feudal economy: we can start from the present pollen rain (0-10 cm deep) and go back in time. The diagram shows an increasing trend of deciduous *Quercus* pollen around 1600 (with increase of *Cerealia*, *Secale* as well) to the 1820s. This feature is consistent with the effects of the local system of common land management on trees and herbs. At present, in the small basin of the Lago di Rezzo, other species of *Quercus* are present while *Quercus cerris* is lacking. This observation is completed by the description of the oak tree canopy of the same basin slopes, as documented in a woodland inventory (Bertolotto *et al.*, 2000) of the parish of Rezzoaglio (compiled by Forestry Administration in 1822). The site is described here as ‘*terre alberate di cerro*’, meaning a land bearing Turkey oak trees. The inventory also specifies their use as ‘*cerri da foglia*’, referring to the importance of this species for leaf fodder production. The shredding Turkey oak trees was largely still in practice in the 1950s but it was a

relict of a more complex previous system. The ‘*terre alberate di cerro*’ of the first half of 19th century were still part of the Turkey oak wood-pasture common land system. They were grazed by large flocks of transhumant sheep and goats (of which the coprophylous fungi in the pollen diagram can be a clue, Figure 7-2), providing, through an annual cycle, leaf fodder, hay, and cereals as temporary crops (see *Cerealia*, *Secale*, *Rumex acetosella* in the pollen diagram as an indicator species of a temporary field system: small patches of land were cultivated by sowing cereals in between trees (Watkins, 2014). The annual cycle also included a set of different agrosilvopastoral practices employing controlled fire (this activity and its variation in time is evidenced by the micro-charcoal regular trend in the pollen diagram in Figure 7-2).

In the same way a medieval phase (1150-1300 AD) could be identified as characterized by the increase of deciduous *Quercus* and *Corylus* pollen, the presence of *Pteridium*, and micro-charcoal variations. These trends have been related to an increase in the importance of pig farming activity on the lands of Bobbio Abbey founded in the Trebbia Valley in 614 AD by the Irish monk Saint Columbanus. It is interesting to note that a very early representation of a shredded and pollarded oak tree is found in the crypt of the Bobbio Abbey church. In the mosaic, dated to the second half of the 12th century, the image for the month of November shows pigs and sheep feeding on acorns under a shredded oak (Watkins, 2014, Figure 7-3). Some of the environmental indicators characterizing the two pollen phases are summarized in Table 7-1.

Table 7-1: Woodland history indicators at Lago di Rezzo, High Trebbia-Aveto Valley. The bold text indicates certain possible environmental indicators related to the medieval and postmedieval phases of Turkey oak trees/woodland expansion.

<b>POSTMEDIEVAL PHASE (1600-1820 AD)</b>	<b>MEDIEVAL PHASE (1150-1300 AD)</b>
<b><i>Quercus</i></b>	<b><i>Quercus</i></b>
<b><i>Cerealia</i></b>	<b>Cichorioideae</b>
<b><i>Secale</i></b>	<b><i>Pteridium aquilinum</i></b>
<b><i>Rumex acetosella</i></b>	<b>Microcharcoal</b>
<b>Rosaceae</b>	<i>Corylus</i>
<i>Coprophylous fungi</i>	Asteroideae
<b>Micro-charcoal (regular trend)</b>	<i>Alnus</i>
<i>Plantago</i>	Poaceae
Cichorioideae	

In the same township, a 16th century map – made to settle a border dispute between the village of Coli and the Bobbio Abbey – documents many scattered and shredded turkey oaks around the village of Coli, near Bobbio. The individually named and owned Turkey oak trees (*cerro*) were growing on common land, but does the map show a continuity of management for sheep and pig pannage of the medieval expansion phase? Each tree is named, which emphasizes the importance of the ownership of every single oak tree. The diffusion of such a peculiar woodland microtoponymy is an effect of the resource access regime called ‘*propriété arboraire*’, or tree ownership, which can be found in certain Mediterranean pastoral regions (Provence, Corsica, Liguria; Coppolani *et al.*, 2015) as well as in the Alps, where individual possession of the single tree is separate from the possession of the common ground. This kind of resource access can be a sign that the customary common land system for centuries allowed the integration of the potential conflict between shepherds and farmers over the use of Turkey oak fodder resources.

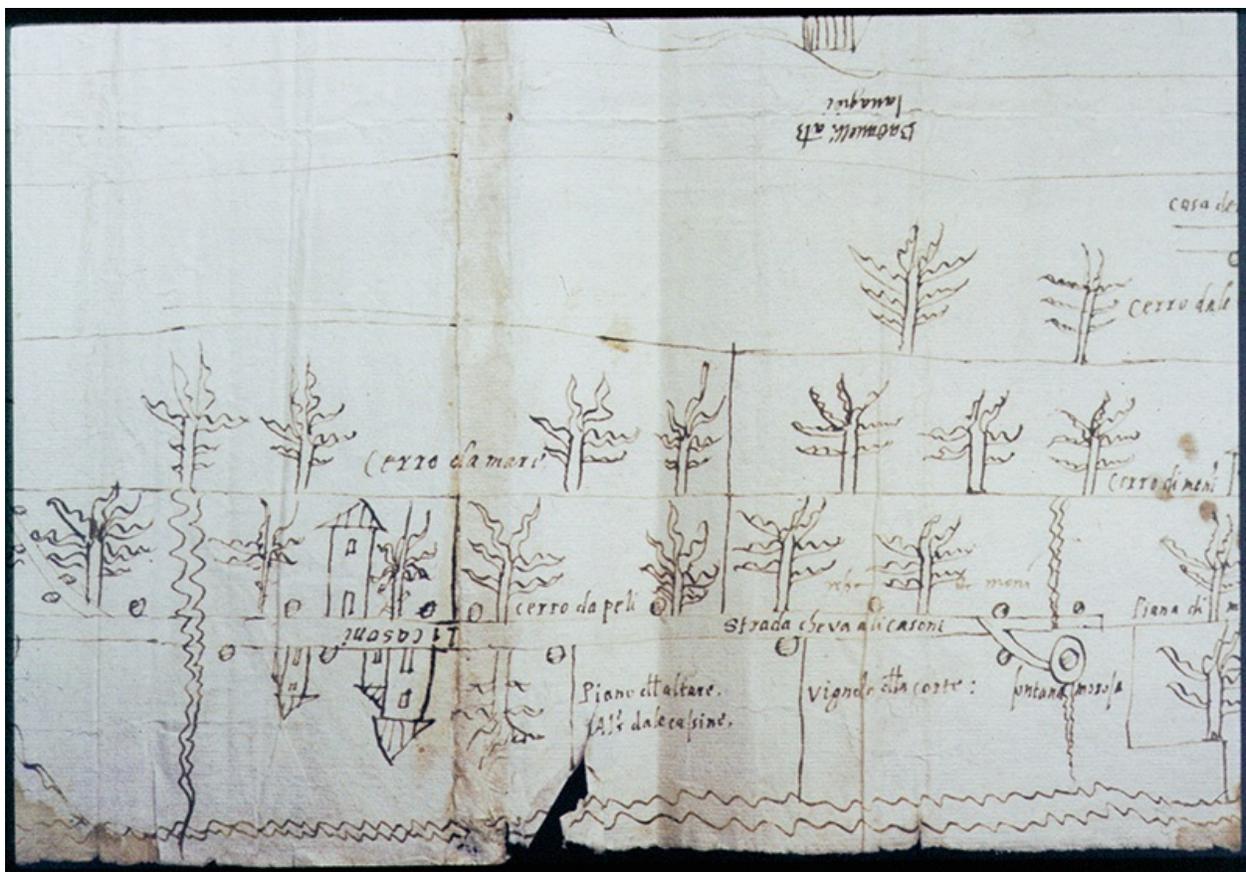


Figure 7-3: Upper Trebbia Basin. A hamlet part of the Coli parish in the Bobbio township: an ‘individual landscape’ showing scattered Turkey oaks in a manuscript map (1564 AD, A.S.P., Uff.Confini, b.busta 266/1, Paulo de Podio, A public notary, 27/09/1564).

Extending these results to the present day distribution of Turkey oak, site data as well as textual and iconographic documents suggest that *Quercus cerris* ‘woodlands’ in the Ligurian Apennines have some common widespread features. They have been continuously managed almost since medieval times in multiple use common land systems. Rather than a woodland ecosystem, this reflects a system of ‘land bearing trees’ (*terre alberate*). These kinds of populations were planted/promoted up until the 1820s and generally managed as single trees producing domestic fruit/leaf. This type of management declined slowly between 1850 and 1950 following the decline of transhumant sheep flocks and the demise of common land rights of access. The postmedieval phase of Turkey oak expansion was preceded by an important (medieval) phase of Turkey oak management possibly connected with pig farming pannage practices associated with Bobbio Abbey. It is interesting to note that there was no apparent conflict in obtaining acorns and fodder from the same trees: we find this in some specialized areas of 19th century Ligurian chestnut orchards.

Can the current Turkey oak woodland in this part of north-western Apennines be considered ‘ancient forests’? These arboreal populations show a long genetic continuity (see the continuous curve in pollen diagrams), and in the Trebbia Valley some Turkey oak veteran trees (from ancient wooded pasture) are still living. In fact, each individual tree could be a historical living archive of this past management: shredded individuals can (in this mountain area) easily live for more than a hundred years. In the nearby Upper Vara Valley, living shredded *Quercus cerris* trees have been cored for dendrochronological analysis, revealing an age ranging between 35 and 200+ years (Howard *et al.*, 2002).

## Merula Valley

In the Merula Valley, the watershed vegetation cover was recently (2015) classified as ‘mixed woodland’ (with *Quercus pubescens*) by a regional government land-use map (Table 7-2 line 10). Different *Quercus pubescens* populations on this slope have been observed to have different responses to water stress. Six sites (ME1-ME6) were chosen to investigate the site ecology to understand its past land-use history. Results from surveys of archaeological features, soil profiles and present vegetation have been compared with land use and plant cover as shown in a series of topographical maps from different dates using a regressive method. A list of analysed maps (1750-2015 AD) is shown in

Table 7-2 and comparisons are given in Table 7-3. Field observations undertaken in winter 2017 are summarized in Table 7-4.

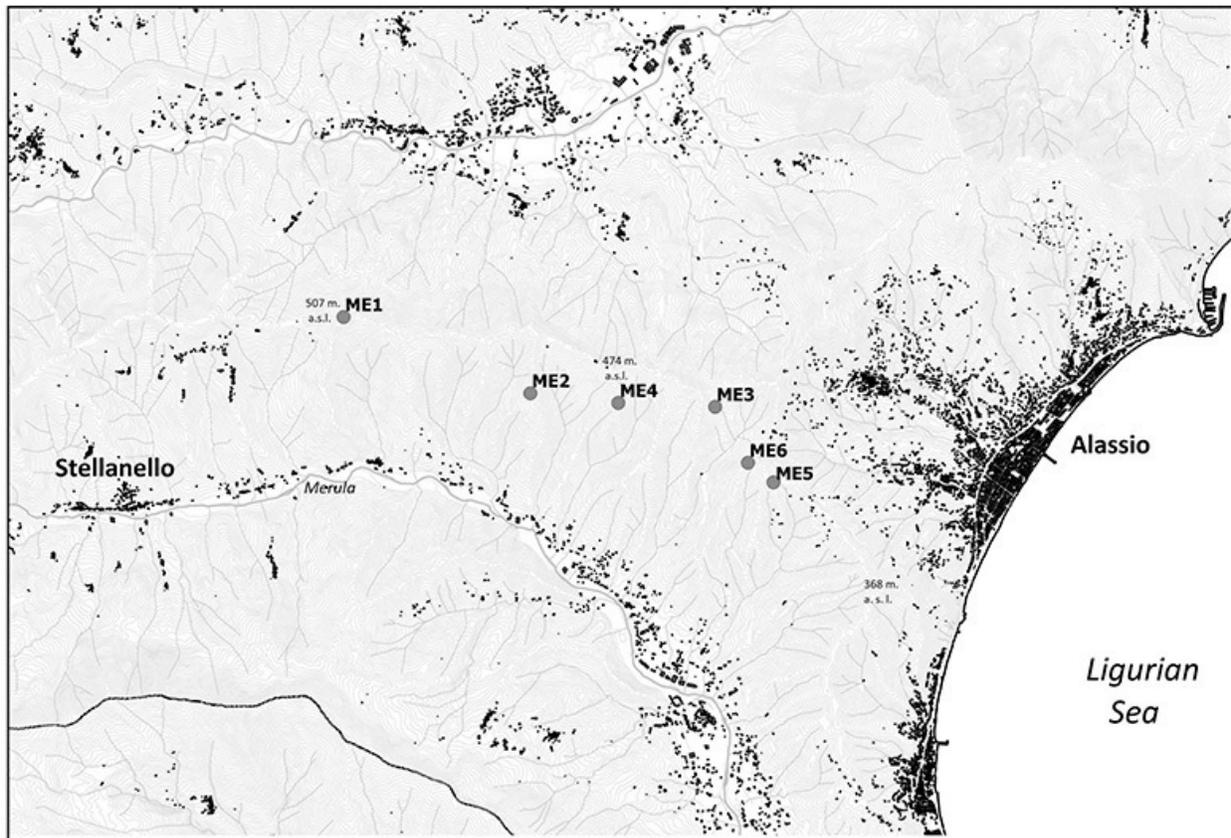


Figure 7-4: Distribution of sites studied in a portion of the eastern watershed of the Merula creek valley, western Riviera (Liguria, NW Italy).

Table 7-2: Merula Valley map references (1750-2015 AD).

<b>1750 (around)</b>	Carta Topografica in misura del Litorale della Riviera di Ponente, Parte V, Ufficio Topografico del Corpo di Stato Maggiore del Regno di Sardegna, ms, 1:9450
<b>1829</b>	Ricognizioni eseguite alla scala di 1/20,000 che comprendono le due Riviere degli ex Stati Sardi e parte delle attuali Provincie di Alessandria e di Pavia, 1:20,000
<b>1852</b>	Gran Carta degli Stati Sardi in Terraferma di S.M. il Re di Sardegna, 1:50,000
<b>1879</b>	Tavole della Carta d'Italia dell'Istituto Geografico Militare, Foglio 92 n. III, Alassio (1:50,000)
<b>1944</b>	Aerial photograph, Royal Air Force flight RAF, Istituto Geografico Militare
<b>1936</b>	Nuovo Catasto Terreni – Stellanello/Andora 1:2,000
<b>1996- 2013</b>	Carte delle Aree percorse dal fuoco, Corpo Forestale dello Stato e Regione Liguria (1:2,000)
<b>2007, updated 2016</b>	Carta Tecnica Regionale, Liguria, 1:10,000 ed.

<b>2013</b>	Tipi Forestali della Regione Liguria (1: 25,000)
<b>2015</b>	Carta Uso del Suolo Regione Liguria (1:10,000)

Table 7-3: Merula Valley land use/cover history at the studied sites: results of map comparison (1750-2015 AD). X = no record available.

Site/Date	1750	1829	1852	1879	1945	1956	2015
ME 1	X	Pines	Gerbido Wooded / meadow	Uncertain	Wood	X	Mixed wood
ME 2	X	Pines	Wood	Land bearing trees	Wooded / meadow	X	Mixed wood
ME 3	X	Wood	Wood	Open area	Wooded / meadow	Wooded pasture	Mixed wood
ME 4	X	Open area	Open area	Open area	Wooded / meadow	Pasture	Mixed wood
ME 5	Wood	Open area	Gerbido Wooded / meadow	Wood	X	Wood	Wood
ME 6	Wood	Wood	Wood	Wood	X	Wood	Pine wood

Table 7-4: Archaeological features from field survey, soil profile and current vegetation of the Merula Valley (Winter, 2017). X = no record available.

Site/ Sources	Dendrology	Pedology (soil profile)	Charcoal in soil profile	Archaeological features
ME1	<i>Pinus pinaster</i> : 100-200 y <i>Quercus pubescens</i> : 100 y	A: 10YR 3/3 C: 10YR 4/4	in A horizon	Clearance stone cairns; earth bank terraces
ME2	<i>Quercus pubescens</i> 30 y Fire scar: 1986 and 1994	X	X	Stone walled terraces, shieling ruins
ME3	<i>Quercus pubescens</i> : 27-30 y	X	X	Stone walled terraces
ME4	See transect	A: 7.5YR 4 (B): 7.5YR 5/6 C: 7.5YR 6/8	in A and B horizons (fire-induced coppice)	X
ME5	<i>Erica arborea</i> and <i>Quercus pubescens</i> : 30-35 cm	Litter A: 10YR 3/3 C: 10YR 6/6	charred stems	Stone walled terraces (two typologies, see discussion below)

ME6	<i>Quercus pubescens</i> and <i>Pinus pinaster</i> : 70-80 cm	Litter A: 10YR 4/3 B: 25YR 7/6 C: 10YR 6/8	X	X
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The ME1 site shows a thermophile deciduous wood with conifers which is described by the official land-use map (Table 7-2) as ‘mixed broadleaved forest’. Nevertheless, according to cartographic sources from the first half of 19th century (Tables 7-2 and 7-3) the land cover was a wooded meadow, bearing pines. An environmental archaeology survey allowed us to identify a rare population of Maritime pines (*Pinus pinaster*) that were 100 to 200 years old mixed with some downy oak (*Quercus pubescens*), possibly around 100 years old. Clearance stone cairns were detected, probably linked with past wooded meadow use for hay production (19th-20th century). A preliminary botanical survey indicated (not unexpectedly) both wood habitat species and meadow species. A soil profile clearly showed a forest soil with traces of recent fire (charcoal in the most superficial part of the A horizon).

The ME2 site shows a mixed oak wood with Mediterranean scrub understorey, described by a current land-use map as ‘mixed wood’. The pines have disappeared and the downy oak trees show the effects of a wildfire regime established on this slope over the last 30 to 40 years. Past fire effects appear in the form and shape of the downy oak. Oak trees take the form of coppiced stumps (‘coppice by fire’) and show irregular rings growing with recurrent fire scars. As for ME1, we found archaeological remains such as ruined buildings, probably with a phase of pastoral shelter use, and terraced land.

The ME3 site shows a genetic continuity of tree populations, probably downy oak; the tree cover can be traced back to 1829, with infilling by hornbeam and Mediterranean shrubs due to the recent establishment of a new fire regime. As in the previous site, we found traces of terraced land under the tree canopy.

The ME4 site is Mediterranean scrub with downy oak infilling due to the recent fire regime. We classify this vegetation cover as ‘recent woodland’ since it is derived from previous (possibly the 19th century) pastoral open land. A transect showing the present vegetation structure is presented in Figure 7-4; in the same picture a first field document of the soil profile is shown. This diagram shows a very thin soil with two distinct horizons which contain charcoal remains. These

can be clues of the recent fire regime (in the upper horizon A) and the previous pastoral fire regime (horizon B).

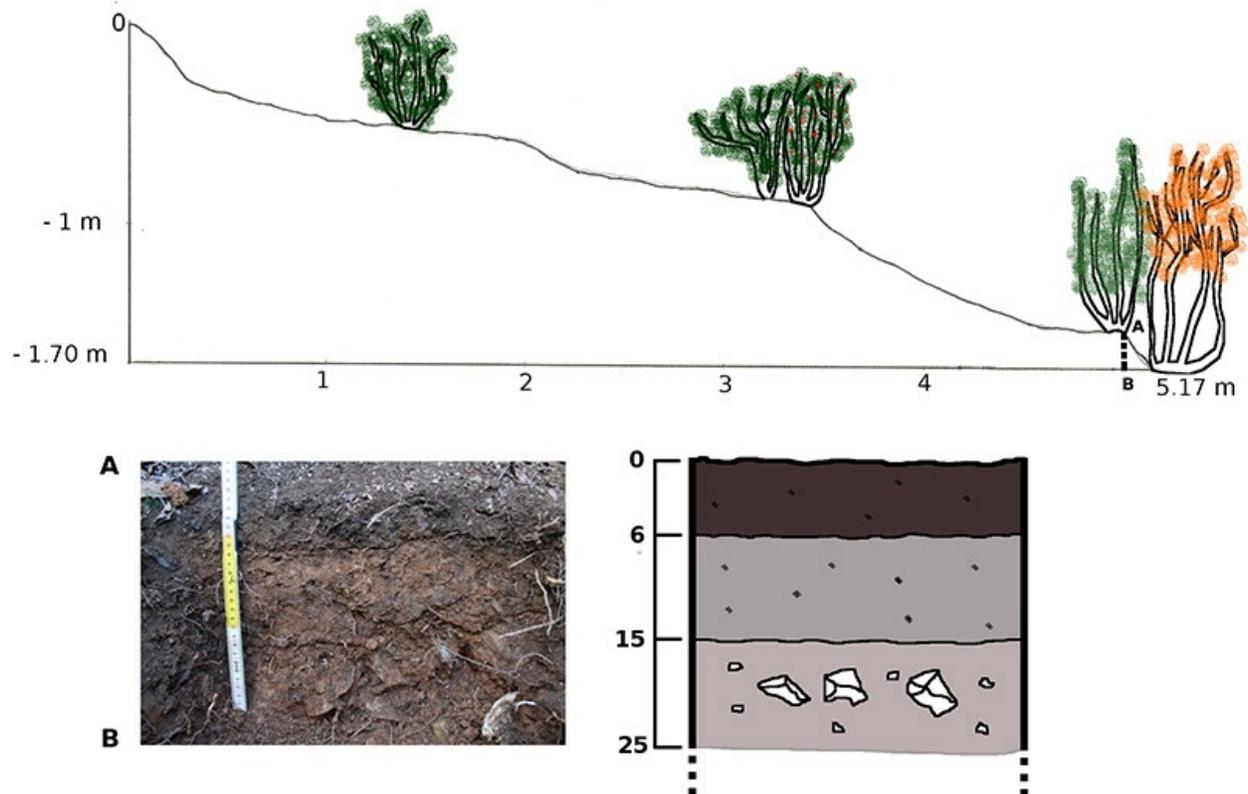


Figure 7-5. Transect of the present vegetation in the Merula Valley, with soil profile at Site M4.

For the ME5 site, cartographic analysis proves the presence of an ‘ancient woodland’ site. In 1750 AD (Table 7-3) this area was shown as a wooded site; in the following years its uses changed. The 1852 map documented it as a wooded meadow site. This discrepancy could be due to the application of different classification methods of the same (continuous) land cover by surveyors evaluating the density of trees differently. Continuity of the tree population seems to be granted at this site. Field observations show a terraced slope, with indicator species such as *Coronilla emerus*, which confirms a thermophilous deciduous woodland habitat; the ancient wood cover appears now infilled by Mediterranean shrubs regularly burnt under the present wildfire regime.

Similarly, an ancient woodland site is documented in ME6 by a 1750 map. Cartographic analysis shows a clear continuity of land use and land cover. At present we find a mixed population of downy oak and maritime pines (estimated to be around 100 years old). The soil profile also shows a mature woodland soil.

To conclude, the comparison of field and documentary sources allows us to divide the studied sites into two groups. A first group (ME1 and ME6) is characterized by woodland cover (or better, ‘land bearing trees’) with continuity of management practices and land uses. We consider this group to be an ‘ancient forest’. The second group (ME 2, 3, 4, and 5) is characterized by a discontinuity in management practices and land use over the past 250 to 300 years.

It is interesting to note that, according to Italian National Forest Inventory data[10], Liguria shows the largest quantity of deadwood in Italy. In the structural ecology approach this parameter is currently used to define the present ecology of an ancient forest (Blasi *et al.*, 2010). In a sense, and based on the information of the recent official maps on land use and the NF Inventory data, we could classify all the woodland of the Merula Valley slope as an ancient forest. Using a historical approach to individual woods (or individual sites) allows us to shed more light on complex vegetation and soil dynamics.

By comparing different environmental dynamics leading to the present plant cover in an individual landscape of this type of Mediterranean valley, the role of past local land management systems in shaping sites can be carefully evaluated.

In the Merula Valley, indications about the transition from an ordered pastoral fire regime to present uncontrolled fires emerge from the combined study of historical topographical maps and field observations (plants, soils, dendroecology) carried out at a topographical scale. For the area covered by the study sites, the Italian State Forestry Corp (*Corpo forestale dello Stato*, CFS) has recorded every fire event since 1969. A first glance of the fire events affecting the examined vegetation is summarized in Table 7-5.

Table 7-5: The establishment of the new fire regime in the Merula Valley. Fire events affecting the studied area, as recorded in CFS registers (1979-1993). Column 1 gives the date of the fire event; column 2 indicates the cadastral location; column 3 indicates the burned vegetation.

<b>WILDFIRES (CFS record) – ANDORA (sheet 3)</b>		
<b>Date</b>	<b>No. of land parcels</b>	<b>Burned vegetation</b>
16/01/1979	5	Maritime and Aleppo Pine, brooms
24/02/1980	Sheet 3 fully burned	
15/08/1981	8	
27/09/1983	30	
1, 2 and 5/09/1986	271	
29/01/1989	Sheets 1, 2, 3, 6, 9, 12 burned	Pines, coppices, maquis

4 and 5/03/1990	24	Pines, coppices, maquis
31/12/1992	7	Coppices, maquis
19/08/1993	3	
3 and 4/02/1993	6	Pines, coppices, maquis

<b>WILDFIRES (CFS record) – ANDORA (sheet 6)</b>		
24/02/1980	28	Coppice, fallow land, shrubland
6 and 7/01/1985	57	
27/06/1986	3	Abandoned cropland
2 and 3/09/1990	20	Pines, maquis

There is some evidence for the medieval phase of fire practices in the Merula Valley. For example, the information hidden in the detailed Latin text of the ancient by-laws (*‘Statuti’*) is of considerable interest, since they regulated the life and economy of the local political community under the seigneurial regime (*‘comunitas’*). A very interesting example is provided by several chapters in the *Statuti* of the community of Stellanello, a text dated 1317 AD with the addition of variations until the end of 18th century when these local regulations were discontinued (Bracciale, 2012). The regulations describe (and proscribe) the practices of people who were clearly very knowledgeable about the use of fire within a system of access to common pastoral resources. This management is called the *‘bandita’*, or multiple land uses, which allowed the use of controlled fires in certain areas of the valley. New perspectives can be opened by the research into archaeological remains of this medieval (or more ancient) fire regime, which we assume we have recovered in the ME4 soil profile. Specific anthracological work is planned in this direction.

If we go back to the different water stress reactions observed in the different *Quercus pubescens* population sites, we can now suggest a fresh interpretation of the ecological response as historically-derived, or as a consequence of the specific historical processes that have affected the specific site ecology.

## Conclusion

The two case studies highlight the role of different past pastoral practices in the management of the tree canopy, such as the importance of leaf fodder production

between the 19th and 20th centuries for Turkey oak or the fire regime established by the system of coastal *Bandite* (settled here at least since the 14th century) and its variations during the 19th century in pastures with scattered pines. Certain tree populations present a long continuity in the observed sites (e.g., with a continuous trend in pollen diagrams) and some veteran trees are still living in the valleys. Site biodiversity changes over time depending on changes in the type of woodland resource management.

As discussed above, in Liguria and across the entire Mediterranean area, the present ecology of ancient forests depends more on the environmental legacy of tree-bearing land (which has had at least more than three centuries of ecological continuity) than a historical natural or semi-natural woodland.

The results of this research can be applied to planning documents and maps, with the aim of improving the accuracy of the environmental dynamics they assume and, consequently, the scope of their contents.

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## References

Arnold H., (Ed.) 2016. Oliver Rackham (1939-2015) in *Nature Cambridgeshire, Special Issue*. Jennifer Moody and *Nature in Cambridgeshire*, Cambridge, 127 p.

Bertolotto S., Cevasco R., 2000. Fonti osservazionali e fonti testuali: le “Consegne dei Boschi” e il Sistema dell’“alnocoltura” nell’Apennino Ligure Orientale (1822). *Quaderni storici*, 103 (1), 87-108.

Blasi C., Burrascano S., Maturani A., Sabatini F.M., 2010. Contributo tematico alla strategia nazionale per la biodiversità, *Foreste vetuste in Italia*, Palombi a,d Partner, Rome, 28 p.

Bracciale R., 2012. Proprietà collettive negli statuti rurali del ponente ligure: alcuni rilievi e riflessioni. In: *Propriété individuelle et collective dans les États de Savoie* (M. Ortolani, O. Vernier, M. Bottin, Eds.), Serre editeur, 47-61

Cevasco R., 2004. Multiple use of tree-land in the northern Apennines during the post-medieval period. Linking clues of evidence. In: *Ligurian landscapes: studies in archaeology, geography and history* (R. Balzaretto, C. Watkins, M. Pears, Eds.), Accordia Research Institute, University of London, 10, 155-177.

Cevasco R., 2007. *Memoria verde, nuovi spazi per la geografia*, Diabasis, Reggio Emilia, 300 p.

Cevasco R., 2013. Dai cerri da foglia alle lupinelle: tracce dalle sequenze medievali e postmedievali del Lago di Rezzo (Val d'Aveto, Rezzoaglio – Ge). In: *La Natura della Montagna* (R. Cevasco, Ed.), Oltre Edizioni, Sestri Levante, 453-465.

Cevasco R., Moreno D., 2015. Historical ecology in modern conservation in Italy. In: *Europe's Changing Woods and Forests: From Wildwood to Managed Landscapes* (K.J. Kirby, C. Watkins, Eds.), CABI, Nosworthy Way, 227-242.

Coppolani J.-Y., Florence J., 2015. Hypothèses sur les origines de la propriété « arboraire » en Corse. *Aere Perennius*. Albiana, Università di Corsica, 23-34.

De Rigo A., Enescu C.M., Houston Durrant T., Caudullo, G., 2016. *Quercus cerris* in Europe: distribution, habitat, usage and threats. In: *European Atlas of Forest Tree Species* (J. San-Miguel-Ayanz, D. de Rigo, G. Caudullo, T. Houston Durrant, A. Mauri, Eds.), Publication Office of European Union, Luxembourg.

Grendi E., 1996. *Storia di una storia locale. L'esperienza ligure (1792-1992)*, Marsilio, Venice, 184 p.

Guido M.A., Menozzi B.-I., Bellini C., Olacereani S., Montanari C., 2013. A palynological contribution to the environmental archaeology of a Mediterranean mountain wetland (North West Apennines, Italy). *The Holocene*, 23 (11), 1517-1527.

Hoskins W.G., 1955. *The Making of the English Landscape*. Hodder and Stoughton Ltd, London, 256 p.

Howard R., Lavers C., Watkins C., 2002. Dendrochronology and Ancient Oak Trees: preliminary results from Sherwood Forest, UK and the Val di Vara, Italy. *Archeologia Post Medievale*, 6, 35-47.

Molinari C., Montanari C., 2016. Interdisciplinary approach for reconstructing an alder-based historical agricultural practice of the Eastern Ligurian Apennines (NW Italy). *Environmental Archaeology*, 21 (1), 31-44.

Pescini V., 2018. *Archeologia delle risorse ambientali: fonti antracologiche per la storia del paesaggio e dell'ambiente*, Tesi di dottorato, Università di Genova, 321 p.

Pescini V., Montanari C.A., Moreno D.T., 2018. Multi-proxy record of environmental changes and past land use practices in a Mediterranean landscape: The Punta Mesco cape (Liguria – Italy) between the 15th and 20th century. *Quaternary International Journal*, 463 (B), 376-390.

Praciak A., Pasiecznik N., Sheil D., van Heist M., Sassen M., Correia C.S., Dixon C., Fyson G., Rushford K., Teeling C. (Eds.), 2013. *The CABI Encyclopedia of Forest Trees*. CABI, Oxfordshire, 536p.

Rackham O., 1976. Trees and woodland in the British landscape. In: *Archaeology in the Field Series*, London, Dent, 204 p.

Rackham O., 1980. *Ancient Woodland: its history, vegetation and uses in England*, Edward Arnold, London, 402 p.

Raggio O., 2004. Micro historical approaches to the history of Liguria: from microanalysis to local history. Edoardo Grendi's achievements. In: *Ligurian Landscapes: studies in archaeology, geography and history in memory of Edoardo Grendi* (R. Balzaretto, M. Pearce, C. Watkins, Eds.), Accordia Research Institute, University of London, 10, 97-103.

Watkins C. 2014. *Trees, Woods and Forests. A social and Cultural History*, Reaktion Books, London, 312 p.