



Romania's Oak Forests: Past and Future

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ABSTRACT

According to the recent *Flora illustrata a Romani* (Ciocarlan, 2009) nine *Quercus* species grow spontaneously in Romania: *Q. robur* L., *Q. petraea* (Matt.) Liebl., *Q. polycarpa* Schur, *Q. dalechampii* Ten., *Q. cerris* L., *Q. frainetto* Ten., *Q. pedunculiflora* K. Koch, *Q. pubescens* Willd., and *Q. virgiliana* (Ten.) Ten., but the new taxonomic position of these species is discussed. In ancient times, when forests covered more than 75% of the country's territory, oak forests had a greater range. Over the centuries, oak forests have endured strong anthropic pressure. Periodical extensive deforestation for agriculture, incorrect practice of coppice systems, abusive grazing, air pollution, coupled with prolonged drought and severe defoliation by insects, have led to a dangerous reduction and fragmentation of ancient, large, well-structured, and durable oak stands. With a view to saving these valuable forests it is necessary to launch an active and comprehensive program for the conservation and ecological reconstruction of oak ecosystems, in spite of prolonged forest decline and the strong economic pressure on forests.

Keywords: *Quercus* species, anthropic pressure, deforestation, coppice system, defoliation, conservation, ecological reconstruction

Introduction

Romania is integrated in Europe from a geographical, natural, historical, and cultural point of view. Although of small surface area, the topography, altitudinal variation (0 to 2543 m/8343 ft), climate, and soil conditions of this Carpathian-Danubian country have produced landscapes of both incomparable beauty and extreme scientific relevance

Romania is the only European country that hosts five biogeographical regions (only a maximum of four is found in other countries in Europe) and four altitudinal, climate, and vegetation/soil layers. The floral and faunistic diversity can also be explained by Romania's location at the crossroads of different climatic and floral areas.



1/ Stelian Radu (white coat) with Alexis Ducouso (on Stelian's left) (1992).

Oaks of Romania

According to the recent *Flora illustrata a Romaniiei* (Ciocarlan, 2009), the following nine *Quercus* species are indigenous to Romania: *Q. robur* L., *Q. petraea* (Matt.) Liebl., *Q. polycarpa* Schur, *Q. dalechampii* Ten., *Q. cerris* L., *Q. frainetto* Ten., *Q. pedunculiflora* K. Koch, *Q. pubescens* Willd., and *Q. virgiliana* (Ten.) Ten.; but the taxonomic position of these species is subject to debate. Using different Romanian and European monographs, three conclusions can be drawn based on an analysis of the taxonomic position and the name attributed to the above-named species.

1) Four taxa, namely *Q. robur*, *Q. frainetto*, *Q. pubescens* and *Q. cerris*, are accepted and systematically found with their initial/classic name in all monographs, including in

- the recent *Guide illustré des Chênes* (le Hardÿ de Beaulieu and Lamant, 2006).
- 2) Although more work is needed on this question, *Q. petraea* has been segregated into three subspecies: *Q. petraea* subsp. *petraea*, *Q. petraea* subsp. *polycarpa*, and *Q. petraea* subsp. *dalechampii*. For a long time they were studied and managed in our forestry practice as distinct species.
 - 3) The latest monographic and genetic studies suggest the integration of *Q. pedunculiflora* with *Q. robur* and of *Q. virgiliana* with *Q. pubescens*.

Forests past and present

During the last 3 millennia, the proportion and shape of oak forests have been deeply modified from their primary state. Forest surface area has decreased from 75-80% to a mere 27% (from 18 to 6.3 million ha/44 to 15 million ac); the presence of oak has decreased from 44.5% to only 19.3% (1,139 ha/2,814 ac). Other forest species occur today as follows: beech, 30.4%; coniferous (mainly spruce), 30.3%; and other broad-leaved species, 20.0%.

Considered from a species point of view, the decrease is: *Q. petraea* from 22% to 11.6%; *Q. robur* from 10% to 2.4%; *Q. cerris* and *Q. frainetto*: 5% to 4.9% (both relatively stable); and *Q. pubescens* and *Q. pedunculiflora* from 7.5% to 0.4% (both are endangered species at present).

Over the centuries the extensive natural oak forests have endured strong anthropic pressure. Deforestation for agricultural crops and pasture land, incorrect practice of coppice systems, abusive grazing, acid rains with prolonged droughts, climate change, and occasional severe defoliation by insects, have led to a dangerous reduction and fragmentation of ancient, large, and lasting stands. To this long list of oak enemies must be added, since 1989, the wrongful transfer of state forests to the former owners, incorrect management, economic difficulties, poverty, illicit tree felling, corruption, and absence of a “forestry conscience”.

Research efforts and conservation

Concerns for different aspects of oaks and oak forests (systematic, ecological, management, and conservation) started in the middle of the 19th century with the first true scientific studies appearing in 1886 in the first issue of the centennial *Revista pădurilor* (*The Journal of Forests*). The creation in 1933 of the National Forest Institute (the present Institutul de Cercetări și Amenajări Silvice or ICAS) marked Romania's firm commitment to forestry science and research.

Oak ecological requirements were determined (Stănescu et al., 1997). *Q. petraea*, *Q. robur*, *Q. frainetto*, *Q. cerris*, and *Q. pubescens* were studied using factorial tables, ecological formulae, and cards based on 16 ecological factors and their favorable or limiting values. Valuable groups of genetic resources for the listed species were sorted out and also delimited by ICAS.

The so-called “dieback” of oaks was deeply studied on a systemic base (Alexe, 1984, 1986). This complex phenomenon has increased due to drought and reduced capillary waters, particularly along rivers where hydrological works have been carried out.

In order to stop the oak decline and to preserve these valuable forests, numerous forestry measures have been undertaken over the last 60 years on the basis of scientific research

done by ICAS. These measures were aimed at reducing cutting volumes and establishing conservation areas (protected forests or reserves) for the preservation of oak stands.

To help ensure natural regeneration, more sophisticated forestry management systems and a return of coppiced stands to high forest were introduced into management practices. Reforestation and, recently, ecological reconstruction have also been promoted. A strategy has recently been established for oak forest reconstruction concerning 11 distinct regions based on their location, oak species diversity, and ecology (Roșu, Radu et al., 2012. More details concerning Romania's oak forests and their problems can be found in former issues of *International Oaks* (No. 3, 1993; No. 10, 1999; No. 11, 2000; No. 13, 2002).

Six case studies in conservation

The selection and establishment of protected areas (national and nature parks, forest reserves, and Natura 2000 sites) represent effective measures to protect and conserve valuable oak forests in situ.

Mociar Forest (48 ha/119 ac)

Created in 1932, this small reserve includes 371 very old (between 500-720 years old) *Q. robur* trees, growing on heavy, moist, soils that are susceptible to waterlogging. The trees have conical-shaped trunks (3-4 m/9.8-13 ft in diameter at breast height (dbh) and 18 m/59 ft tall) with dried tops. The original habitat was impossible to reproduce but the understory has been restocked by planting.

Letea Forest (2,825 ha/6,980 ac)

This is the oldest natural reserve in Romania, established in 1938 and located in the Danube Delta. The Letea Forest Reserve was the first step in the foundation of the Danube Delta Biosphere Reserve (UNESCO 1992). Fragments of primary oak forest (with *Q. robur* and *Q. pedunculiflora*) cover depressed zones among higher old-stand dunes. The abundance of climbing liana (*Periploca* Tourn. ex L., *Vitis* L., *Clematis* L., *Humulus* L.) gives the impression of a subtropical forest. Despite its status of protected area, there is strong pressure from humans and domestic animals (horses).

The Breite (Sighișoara) wood pasture (70 ha/173 ac)

Four hundred fifty-four ancient *Quercus robur* pollards (between 400 and 600 years old) grow on this pastured plateau and in the surrounding forest stands. One of the oldest has a circumference of 620 cm/244 in and still shows great vitality. All the life stages can be found: live and vigorous as well as dying and dead trees, snags, and fallen trees – all very important for biodiversity. This type of wood pasture landscape is ascribed to the Saxon colonists, transferred here in the 12th century. Akeroyd considers the Breite oaks to be *Q. pedunculiflora* (Akeroyd, 2003).

Seaca – Optășani Forest Reserve (137-434 ha/339-1072 ac)

This forest is what remains of an ancient and historically one of the largest Romanian forests (2000 ha/4942 ac) with a pure population of monumental *Q. frainetto* (no *Q. cerris*). During his consulting mission in Romania (1888-1889) Gustave Huffel (later Prof. and Dept. Director of the famous Nancy Forestry School) paid many visits to this forest, measuring trees, some of which he found to be more than 200 years old and 32 m/105 ft tall, with a dbh of 1.2 m/3.9 ft. He sent trunk samples to Paris in order to promote export throughout the world of this almost unknown but valuable timber (recommended for making staves and fine furniture).



2/ Stelian Radu and Antoine Kremer (right) (1992).

Bejan Forest (70 ha/173 ac)

Protected since 1936, this forest is known for the fact that in its relatively limited area can be found eight native oak species (all except *Q. pedunculiflora*) and it is thus a remarkable center of hybridization. It has been widely studied in the past (Simonkai, Borbás, Borza, Nyárády, Cretzoiu, Schwarz) and more recently by Stănescu, Șofletea, Stanciu and Curtu. Stanciu found 11 hybrids in Bejan. I had the opportunity to participate in the Schwarz visit (1955) and I also accompanied A. Kremer and A. Ducouso (1992) as well as Guy and Edie Sternberg of the International Oak Society in 1995 (see *International Oaks*, No. 11, 2000). Recently Curtu (2007, 2011) started the taxonomic revision of Bejan oaks and Curtu (2006) and Curtu et al., (2011), the revision of hybrids. This forest is an urban green area for the nearby city of Deva, and as such is subject to strong human pressure.

Runcu – Groși Natural Reserve (262 ha/647 ac)

A reserve since 1982, it is a well conserved, old-growth mixture of *Q. polycarpa* and *Fagus sylvatica* subsp. *moesiaca* (K. Malý) Szafer. The oaks are 130-210 years old and attain diameters at breast height of more than 76 cm/30 in and heights of more than 43 m/141 ft. The beech trees are between 60 and 180 years old. The trees of both species present a large amount of dead wood. I have had the pleasure of accompanying and/or organizing a continuing pilgrimage of French foresters to this reserve, starting with A. Kremer and A. Ducouso in 1992, followed by visits from the GEVFP, WWF, Réserves Naturelles and others.



3/ *Quercus petraea*.

Conclusion

In conclusion, and as witness to our ongoing battle for Romania's oak forests, we are proud to report that the publication of our article "Let us save the remarkable trees – true living treasures, threatened by extinction" (Radu et al., 2006; Radu et al., 2010) finally generated the opening of a necessary *National Register and Album of Exceptional Trees of Romania*, starting with oaks.

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Bibliography

- Akeroyd, John. 2003. A Transylvania wood-pasture. *Plant Talk* 34: 34–37.
- Alexe, A. 1984. Rezultatele unor cercetări de biometrie, anatomie, fiziologie și biochimie la arborii sănătoși și la cei în curs de uscare. *Revista Pădurilor* 3: 135–139
- Alexe, A. 1986. Analiza sistemică a fenomenului de uscare a cvercineelor și cauzele acestuia, *Revista pădurilor*, 1, 2, 3: 5–15.
- Bolea, V., C. Balabasciuc, I. Florescu, and C.D. Stoiculescu. 2011. Proiect de lege privind conservarea arborilor excepționali din România. *Revista de Silvicultură și Cinegetică* 16: 61–62.
- Ciocarlan, Vasile. 2009. *Flora ilustrată a României*. Editura Ceres.
- Curtu, Alexandru L., O. Gailing, and R. Finkeldey. 2007. Evidence for hybridization and introgression within a species-rich oak (*Quercus* spp.) community. *BMC Evolutionary Biology* 7: 218.
- Curtu Alexandru L., N. Sofletea, A.V. Toader, and M.C. Enescu. 2011. Leaf morphological and genetic differentiation between *Quercus robur* L. and its closest relative, the drought-tolerant *Quercus pedunculiflora* K. Koch. *Annals of Forest Science* 68: 1163–1172.
- Le Hardy de Beaulieu, Antoine, and Thierry Lamant. 2006. *Guide illustré des chênes*. Editions du 8^{me}.
- Radu S. and C. Coandă. 2006. Arborii remarcabili - adevărate comori vii, pe cale de dispariție. *Al. XXII-lea simpozion național de istorie și retrologie agrară a României, Deva*: 329–341.
- Radu, S. and C. Coandă. 2010. Să salvăm arborii remarcabili - adevărate comori vii, pe cale de dispariție. *Revista de Silvicultură și Cinegetică*: 32–36.
- Roșu, C., S. Radu, et al. 2012. Cu privire la reconstrucția ecologică a pădurilor de stejar din România. Symposium, București.
- Stanciu, A. 1997. Cercetări taxonomice, morfologice și ecologice privind hibridii genului *Quercus* din Rezervația științifică Bejan – Deva. Teza de doctorat, Universitatea Transilvania din Brașov.
- Stanescu V., N. Sofletea, and O. Popescu. 1997. *Flora forestiera lemnoasă a României*. Editura Ceres.