



# Wood-pastures as social-ecological system archetypes for biodiversity-production reconciliation

Tibor Hartel, László Rákósy, Frank Wagener

## REVIEW SUMMARY

## CONSERVATION

## Landscapes that work for biodiversity and people

C. Kremen\* and A. M. Marenlander

**BACKGROUND:** Biodiversity is under siege, with greatly enhanced rates of local and global extinction and the decline of once-abundant species. Current rates of human-induced climate change and land use forecast the Anthropocene as one of the most devastating epochs for life on earth. How do we handle the Anthropocene's triple challenge: of preventing biodiversity loss, mitigating and adapting to climate change, and sustainably providing resources for a growing human population? The answer is in how we manage Earth's "working lands"; that is, farms, forests, and rangelands. These lands must be managed both to complement the biodiversity conservation goals of protected areas and to maintain the diverse communities of organisms, from microbes to mammals, that contribute to producing food, materials, clean water, and healthy soils; sequestering greenhouse gases; and buffering extreme weather events, functions that are essential for all life on Earth.

**ADVANCES:** Protected areas are the cornerstone of biodiversity conservation. Although the total area of protected regions needs to be increased, parks will nonetheless continue to lose species if these areas are isolated from one another by inhospitable land uses and are faced with a rapidly changing climate. Further, many species, such as those that migrate, remain unprotected as they occupy lands outside

of parks for all or portions of their life cycles. Lastly, protected-area effectiveness is greatly influenced by surrounding land management. "Working lands conservation" aims to support biodiversity while providing goods and services for humanity over the long term, assuring sustainability and resilience. By managing lands surrounding parks favorably, working lands can buffer protected areas from threats and connect them to one another. This approach complements protected areas by providing accessory habitats and resources for some species while facilitating dispersal and climate change adaptation for others. Further, by maintaining the biodiversity that supplies critical ecosystem services within working lands, these approaches ensure that the production of food, fiber, fuel, and timber can be sustained over the long run and be more resilient to extreme events, such as floods, droughts, hurricanes, and pest and disease outbreaks, which are becoming more frequent with climate change. A variety of biodiversity-based land management techniques can be used in working lands, including agroforestry, silvopasture, diversified farming, and ecosystem-based forest management, to ensure sustainable production of food and fiber.

**OUTLOOK:** The underlying principle of biodiversity-based management of working lands has been practiced since ancient times. Today, these systems have largely been replaced

by unsustainable resource extraction, rather than serving as models that could be adapted to modern conditions. Although various regulatory, voluntary, and financial tools exist to promote sustainable land management, many barriers prevent individuals, communities, and corporations from adopting biodiversity-based practices, including deeply entrenched policy and market conditions that favor industrialized or extractive models of land use. Thus, uptake of these approaches has been patchy and slow and is not yet sufficient to create change at the temporal and spatial scales needed to face the triple Anthropocene threat.

Biodiversity-based land management practices are knowledge- rather than technology-intensive. They are well adapted to empower local communities to manage their natural resources. One of the most exciting emerging trends is community-driven initiatives to manage working landscapes for conservation and sustainability. By linking up through grassroots organizations, social movements, and public-private partnerships, these initiatives can scale up to create collective impact and can demand changes in government policies to facilitate the conservation of working lands. Scientists and conservation practitioners can support these initiatives by engaging with the public, listening to alternative ways of knowing, and cocreating landscapes that work for biodiversity and people. ■



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\*Corresponding author. Email: [ckremen@ucdavis.edu](mailto:ckremen@ucdavis.edu)  
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**Strawberry production in Central Coast, California.** On the left, a homogeneous landscape of strawberry monoculture, including organic fields, supports fewer wild species than a diversified, organic farm (right) in the same region, which includes a small field of strawberry, surrounded by orchards, hedgerows, diverse vegetable crops, and natural habitats. The monoculture landscape creates barriers to wildlife dispersal, whereas the diversified landscape is more permeable.



Fig. 1. Rebuilding connectivity in the matrix by using silvopasture. Photo of Finca La Luisa



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PHOTO: C. KREMEN



# Wood-pastures in Europe

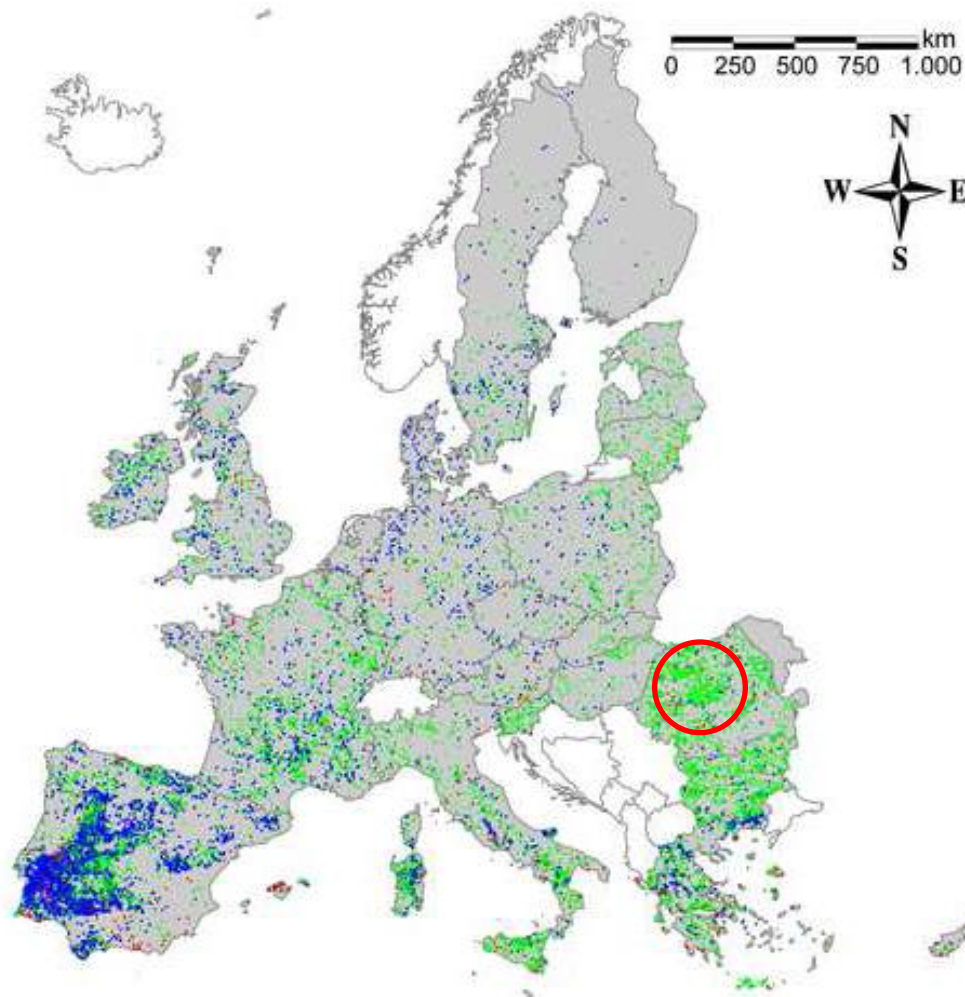


Table 1. Extension of three categories of wood-pastures in 27 EU member states derived from database.

Country	Pastures in open woodlands (km <sup>2</sup> )	Pastures with sparse trees (km <sup>2</sup> )	Pastures with cultivated trees (km <sup>2</sup> )	Wood-pasture total (km <sup>2</sup> )
Austria	364	766	221	1 350
Belgium	150	501	25	676
Bulgaria	969	10 278	201	11 448
Cyprus	16	47	35	99
Czech Rep.	314	457	86	857
Denmark	524	112	0	636
Estonia	21	960	0	981
Finland	274	598	0	872
France	6 644	13 861	544	21 049
Germany	2 494	2 752	344	5 591
Greece	4 200	8 007	1 246	13 454
Hungary	180	1 985	0	2 166
Ireland	1 540	1 981	0	3 521
Italy	3 610	10 477	1 059	15 145
Latvia	102	848	0	950
Lithuania	84	2 124	67	2 275
Luxemburg	24	60	24	108
Malta	0	0	0	0
Netherlands	128	112	32	271
Poland	1 058	3 573	114	4 746
Portugal	10 724	2 693	1 135	14 553
Romania	981	15 278	731	16 990
Slovakia	140	718	0	857
Slovenia	139	919	38	1 095
Spain	36 771	19 407	1 917	58 096
Sweden	2 150	3 086	20	5 256
UK	3 448	4 410	140	7 998
<b>EU-27</b>	<b>85 219</b>	<b>109 247</b>	<b>8 901</b>	<b>203 367</b>

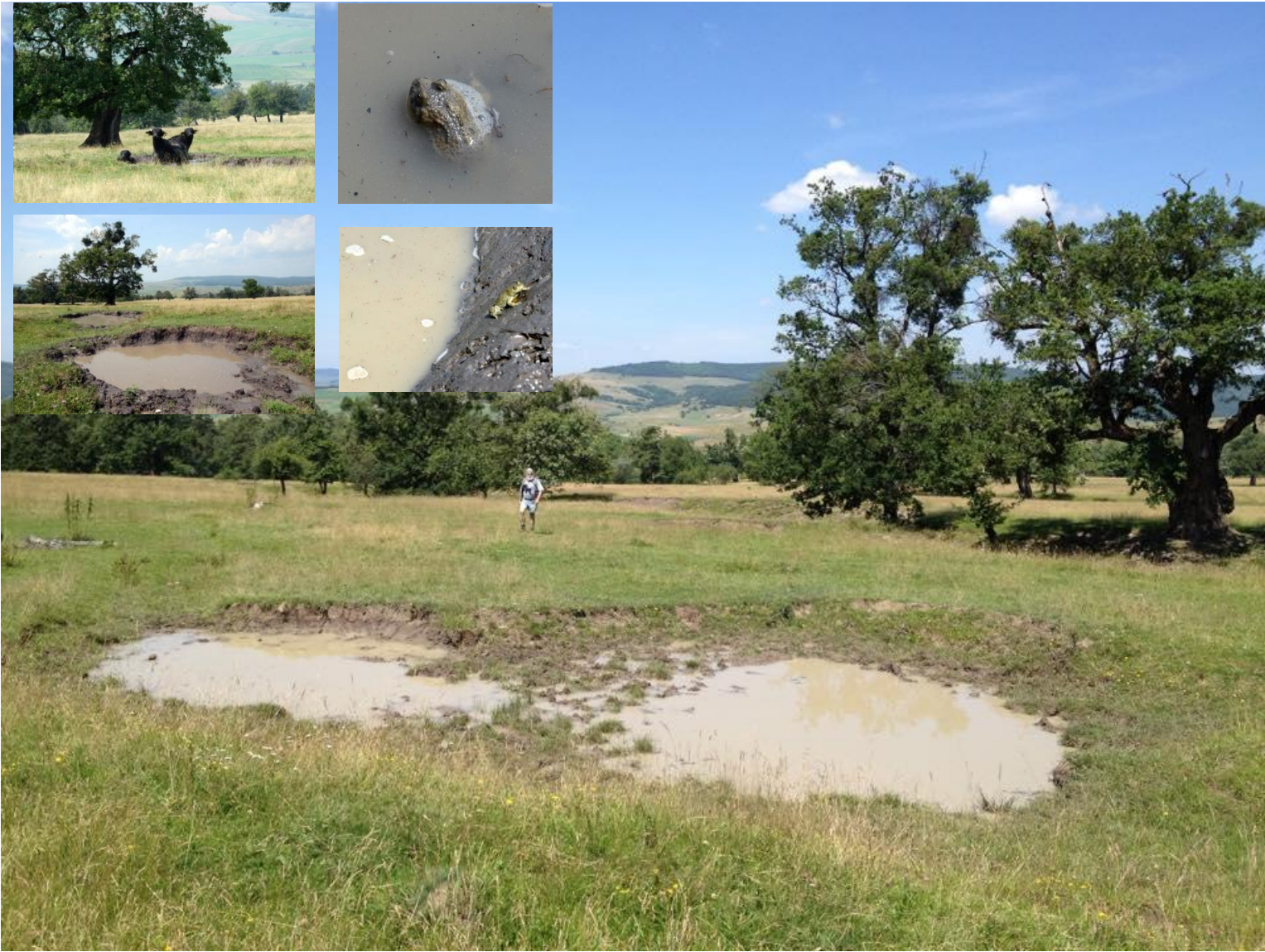






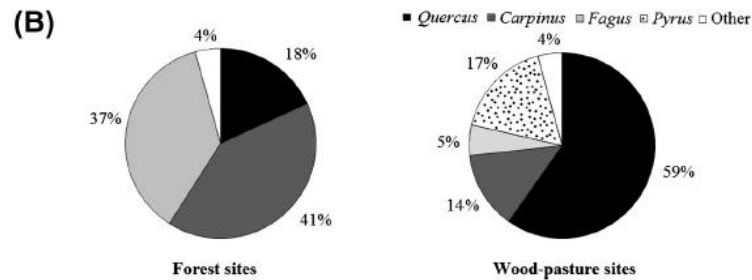
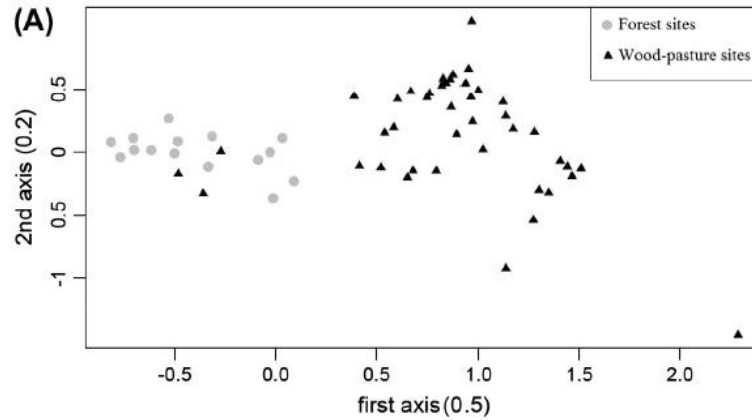


**A) Ecological values: wood-pasture grazed by cattle and buffalo is optimal for toads**

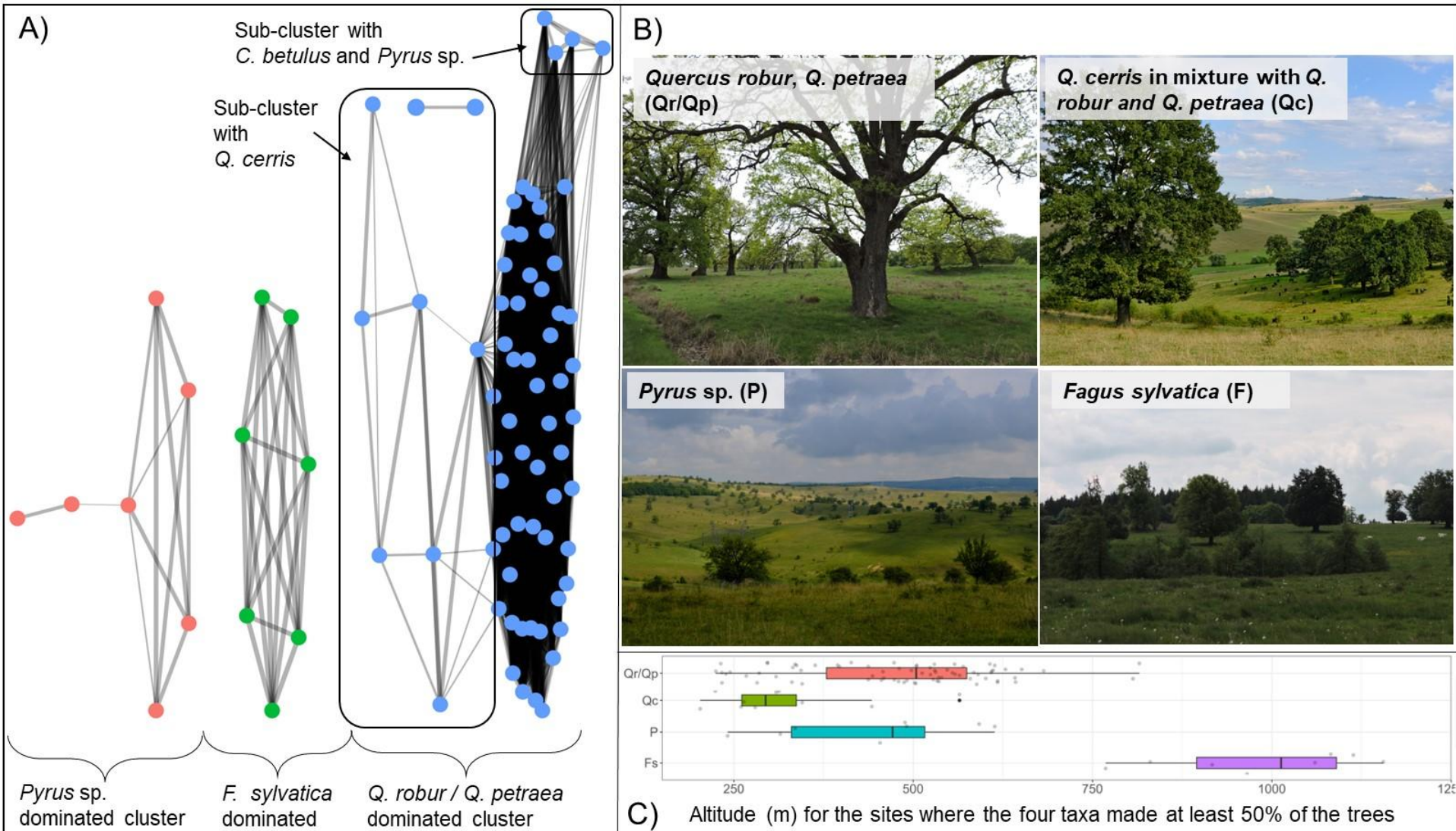




# A) Ecological values: wood-pasture has distinct tree communities



# A) Ecological values: wood-pastures can be profiled based on their common trees





## A) Ecological values: wood-pasture is where the largest trees are

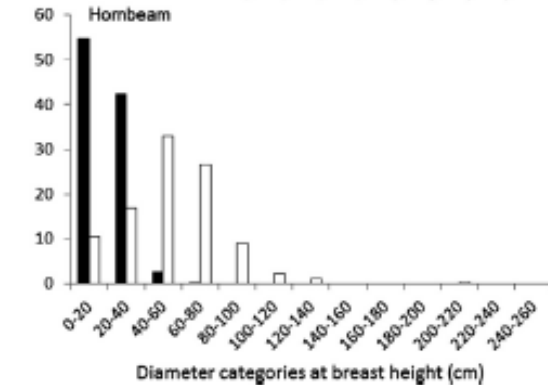
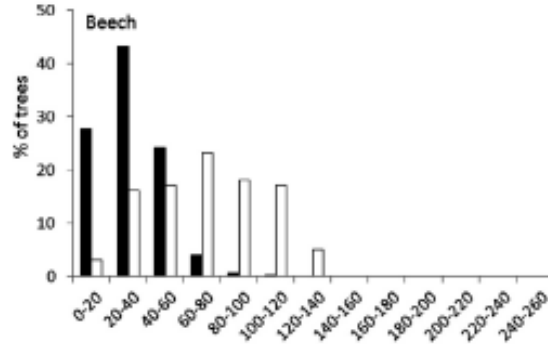
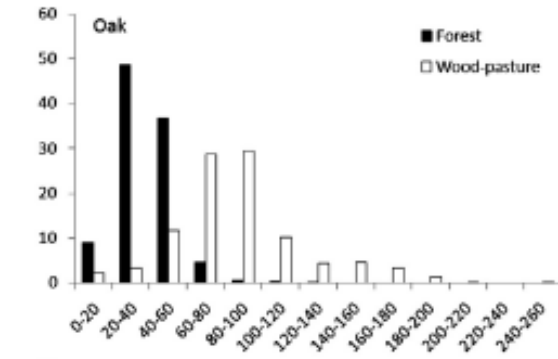


Fig. 3. The percent representation of the tree size categories in forests and wood-pastures. Only Oak, Hornbeam and Beech are shown because these were the most common trees present in both forests and wood-pastures.

# Large old trees

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## Old and ancient trees are life history lottery winners and vital evolutionary resources for long-term adaptive capacity

[Charles H. Cannon](#) , [Gianluca Piovesan](#) & [Sergi Munné-Bosch](#)

*Nature Plants* 8, 136–145 (2022) | [Cite this article](#)

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### Abstract

Trees can live for many centuries with sustained fecundity and death is largely stochastic. We use a neutral stochastic model to examine tree demographic patterns that emerge over time




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### LETTER

Conservation Science and Practice  
A Journal of the Society for Conservation Biology

WILEY

## New Law for Old Trees in Romania: lessons and opportunities

[Tibor Hartel](#)<sup>1</sup>  | [Viorel Arghius](#)<sup>1</sup> | [Florin Stoican](#)<sup>2</sup> | [Kinga Olga Réti](#)<sup>1</sup> | [Laura Bouriaud](#)<sup>3</sup>

<sup>1</sup>Faculty of Environmental Science and Engineering, Department of Environmental Sciences, Str. Pantanele 30, Babes-Bolyai University, Cluj-Napoca, Romania

<sup>2</sup>Kogayon Association—Oltena de sub Munte UNESCO aspiring Geopark, Costesti, Romania

<sup>3</sup>Faculty of Forestry, “Stefan cel Mare” University of Suceava, Suceava, Romania

### Correspondence

Tibor Hartel, Faculty of Environmental Science and Engineering, Department of Environmental Sciences, Str. Pantanele 30, Babes-Bolyai University, Cluj-Napoca, Romania.  
Email: [hartel.tibor@gmail.com](mailto:hartel.tibor@gmail.com)

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### Abstract

Large Old Trees (LOT) are keystone ecological structures and have high cultural and economic importance. Still, LOT are only exceptionally targeted specifically by National Laws and are absent from powerful nature conservation policies (e.g., the Natura 2000 protected area policies of the European Union). Romania recently adopted a Law for its LOT. As persons who contributed to the scientific premisses and the first draft of this Law as well as in the advocacy for Romanian LOT, we present the Law (its weaknesses and opportunities) and provide insights into encourage other countries for adopting the Law specifically for LOT.

### KEYWORDS

conservation, Law, Romania, remarkable trees



## ***Large old trees***





## *Large old trees*



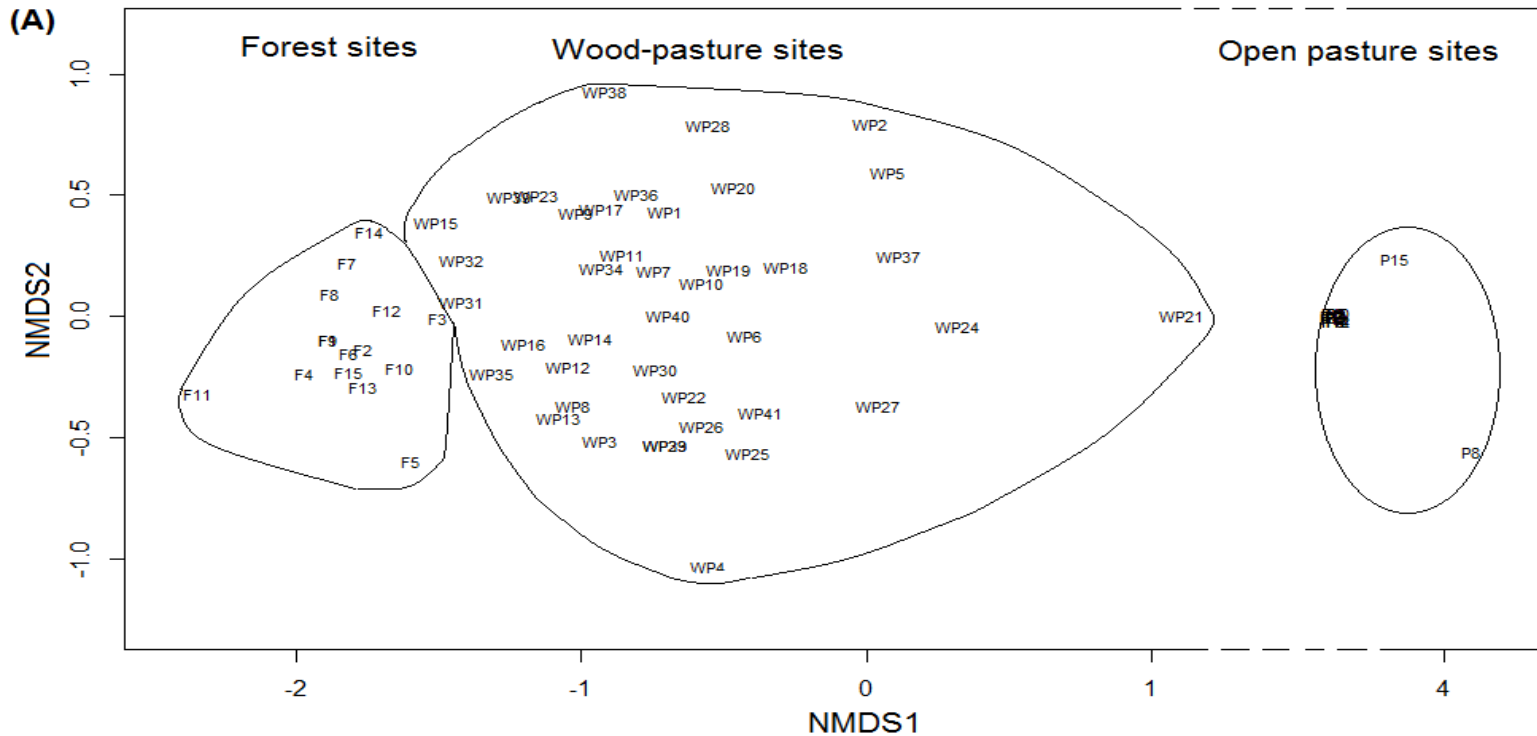


## *Large old trees*



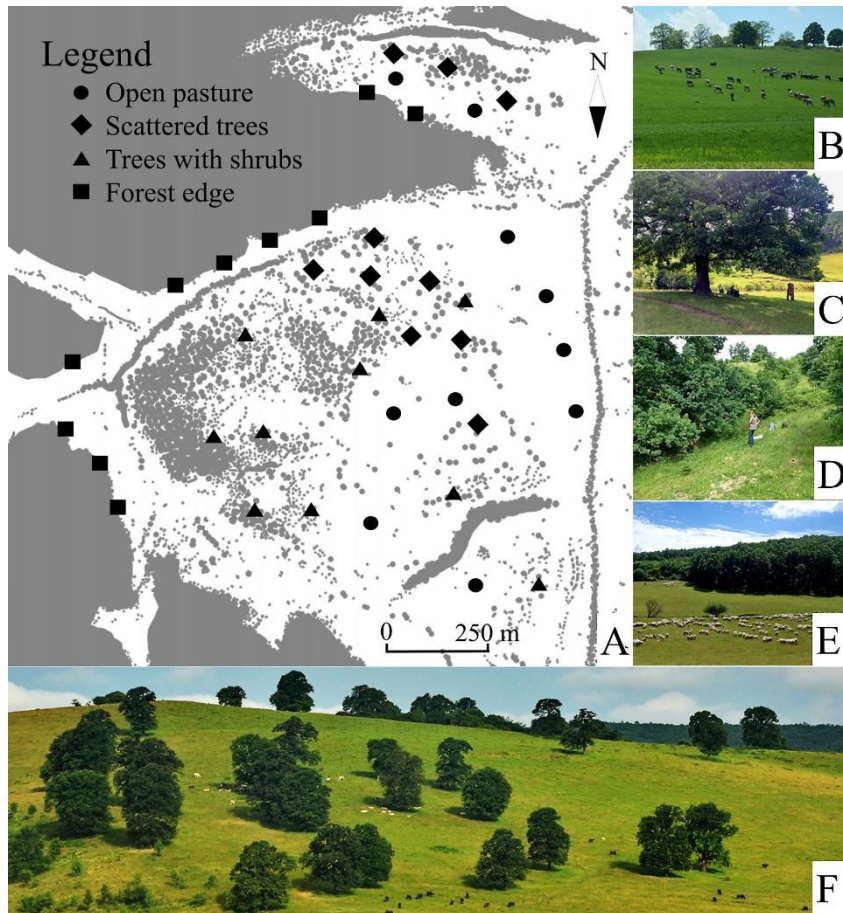


# A) Ecological values: wood-pasture has distinct bird communities

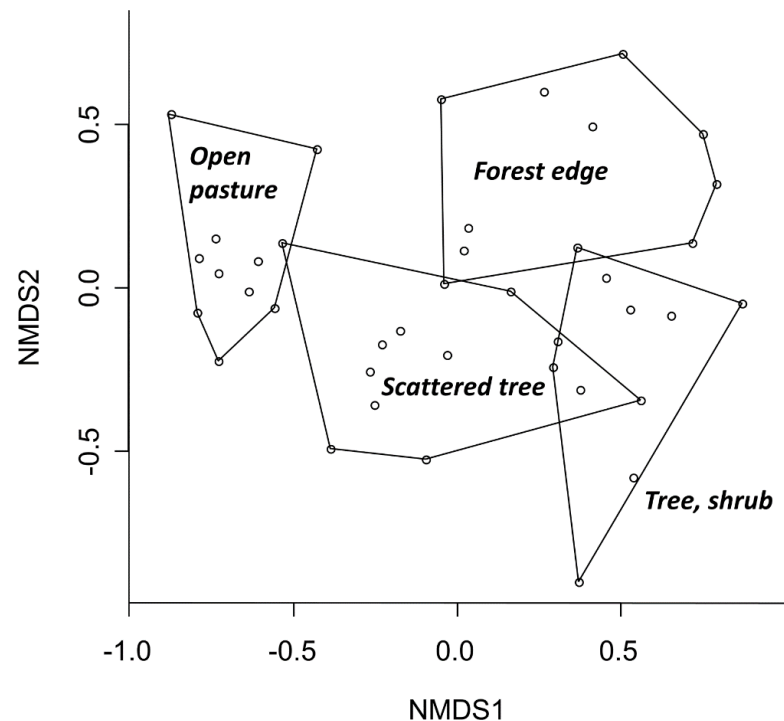




## A) Ecological values: scattered trees and shrubs have distinct spider communities



- 140 spider species
- 18 spider species on various red lists of Europe, some „indicating” natural oak forests
- 4 new species for Romania



## A) Ecological values: bears (and fences)

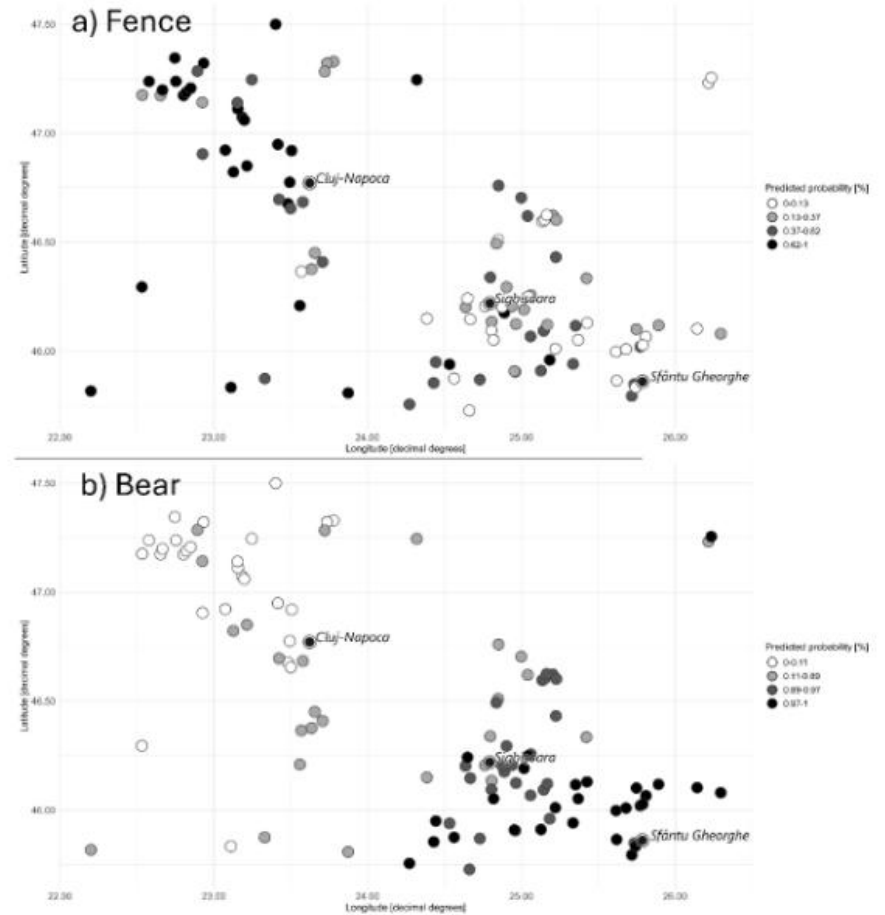


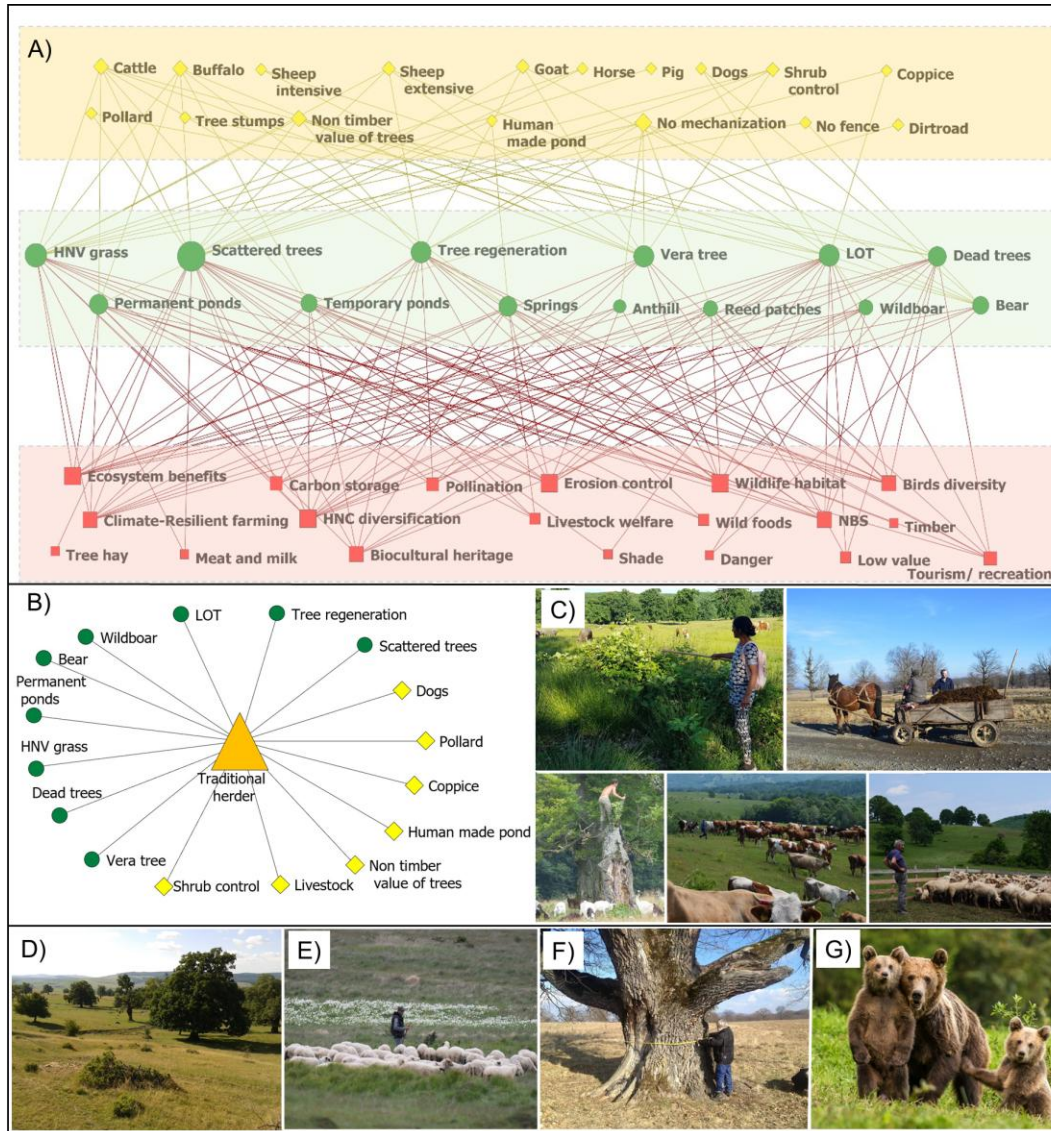
Fig. 3. Predicted probabilities of electric fence occurrence and bear feeding across 107 wood-pastures. Values were derived from fitted logistic regression models.



## A) Ecological values: Reconciling production and nature (conservation)

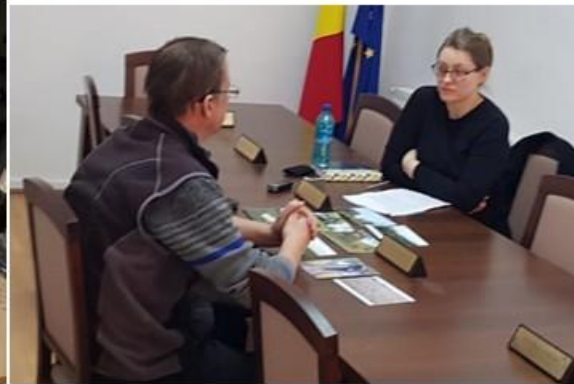


# A) Ecological values are sustained by people





## B) Wood-pastures and local communities





## B) How farmers value scattered mature trees

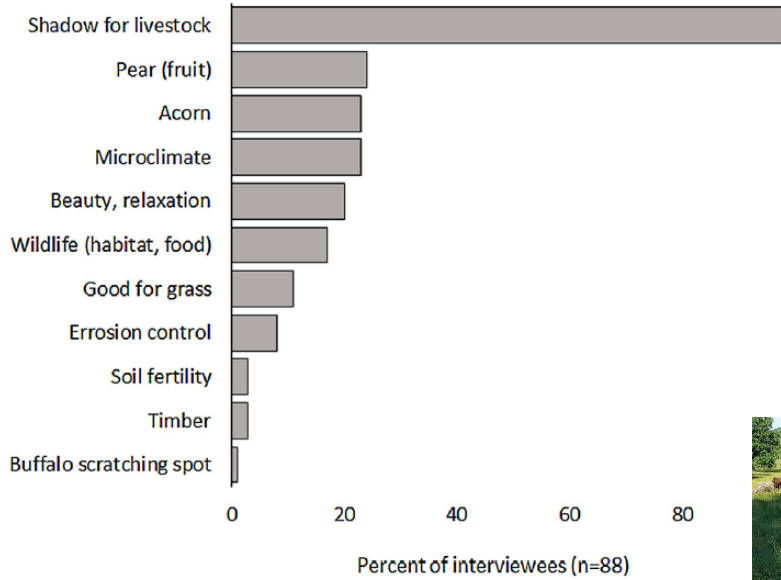


Fig. 1. Values attached to mature trees from pastures by the interviewees.





## B) How farmers value scattered old trees

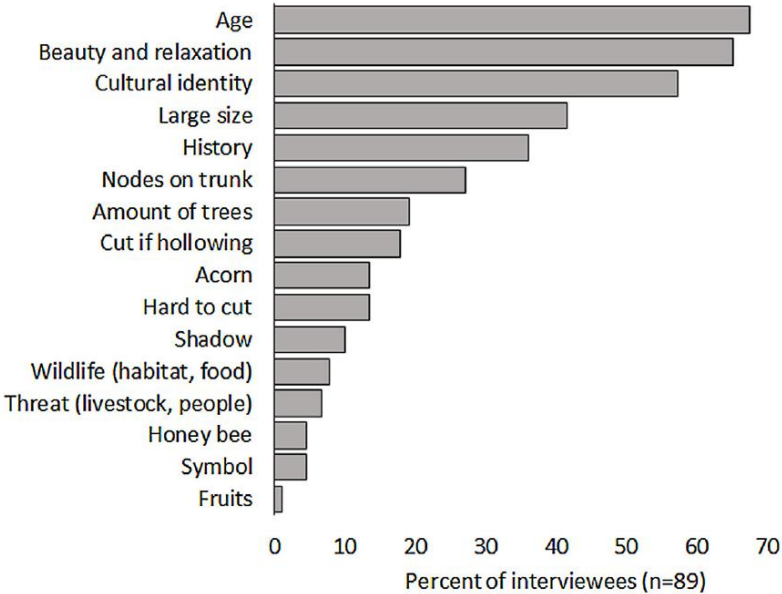
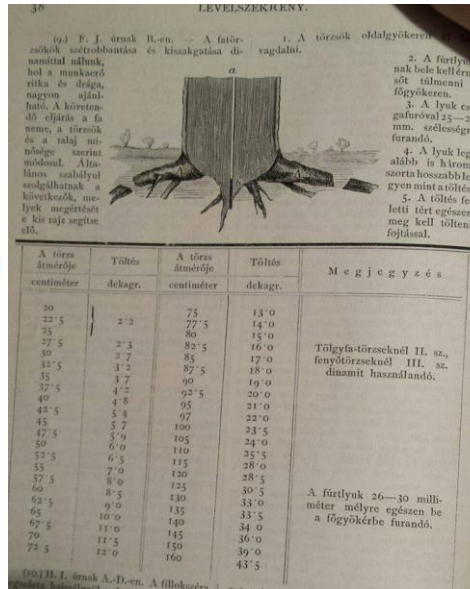


Fig. 2. Values attached to old oak trees from pastures by the interviewees.



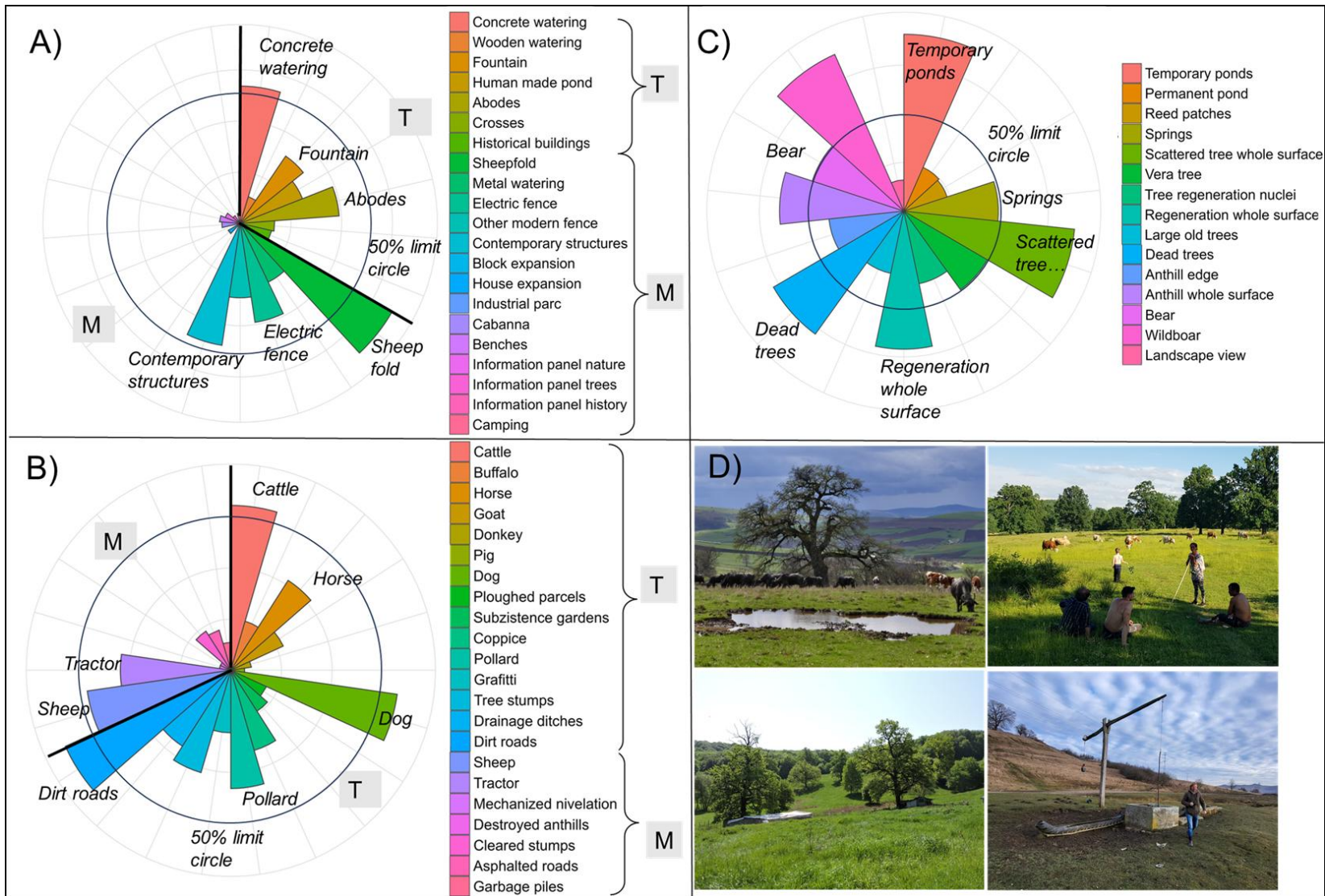


## B) Working (now veteran) trees





# C) Biocultural profile of wood-pastures – forms and practices recorded in the field





# C) Biocultural profile of wood-pastures – based on the interviews



## 1 Profile – abandoned wood-pasture

Due to the emigration of young people and/or changing aspirations, the abandonment of grazing has led to the neglect of pastures. **The lack of innovation and local initiatives hinders the use of natural capital for community-based economic purposes.**



## 2 Profile – Intensive Use

The system has become homogenized and mechanized. The local community is excluded from use. Conflicts and corruption may also occur.



## 3 Profile – traditional management

The pasture preserves its centuries-old structure and ecological processes, and the local community wishes to maintain its cultural and economic functions as well. A key challenge is how to align the diverse aspirations.



## 4 Profile – inherited accident

Local communities have inherited a farming system that has been damaged by intensification. To mitigate the effects of extreme climate change, they need trees, but there are no institutional, cultural, or economic means to support this.



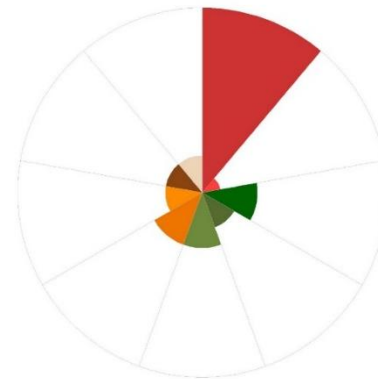
# C) Ecosystem services supply and demand - mismatches.

## The erosion of multifunctionality – tradition modern transition

Ecosystem service provision



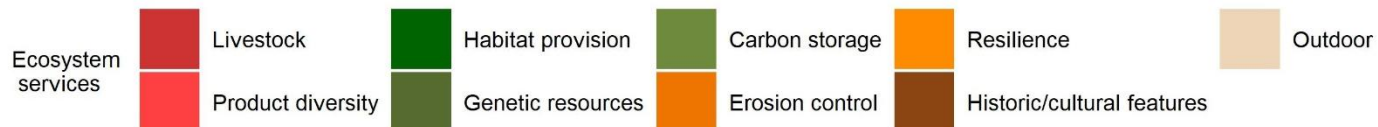
Ecosystem service demand



Mismatch:  
wood-pasture  
systems are not  
used in their full  
potential but  
rather, one well  
defined ES is  
over-used



Dramatic change in  
ecosystem due to  
monofunctional use





## C) Restoring wood-pastures with farmers













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<https://doi.org/10.1080/26395916.2024.2426711>

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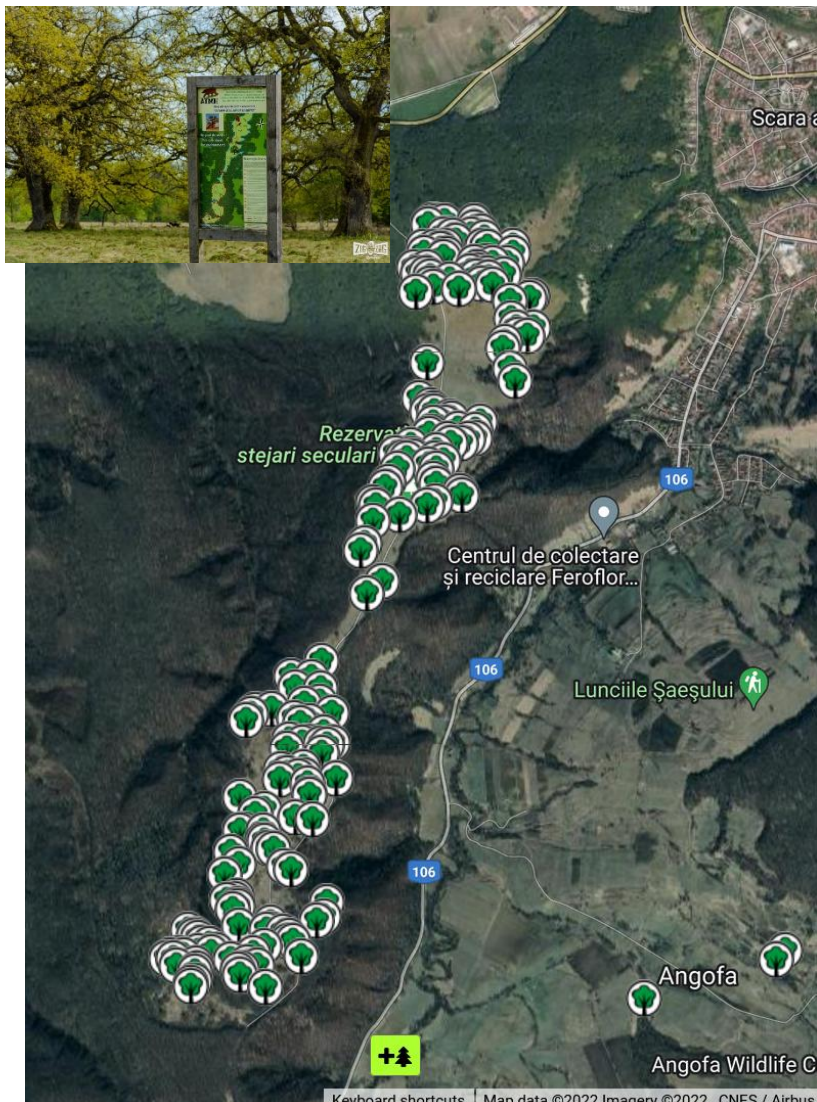
**Understanding nature's contributions to people in ancient biocultural systems through network and RLQ analysis**

Andreea Nita <sup>a</sup>, Kinga Olga Réti <sup>b</sup>, Ruxandra Mălina Petrescu-Mag <sup>b</sup>, Dacina Crina Petrescu <sup>c</sup>, Cristian Maloş <sup>b</sup>, László Csákány <sup>d</sup>, Dietmar Gross <sup>e</sup>, Frank Wagener <sup>f</sup>, Laurentiu Rozyłowicz <sup>a</sup> and Tibor Hartel <sup>b</sup>



# D) Rediscovering wood-pastures?

## The day of the Oak – Breite - Sighișoara – Schäßburg - Segesvár



<https://arboriremarcabili.ro/en/map-and-trees/show-map/>



# D) Rediscovering wood-pastures?

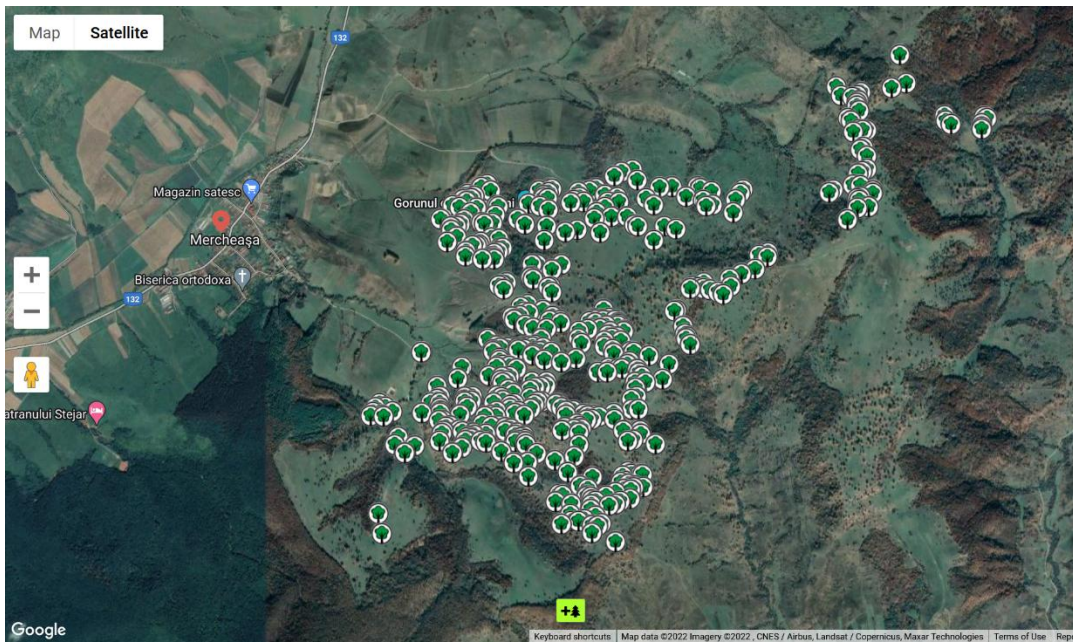
*The day of the Oak – Breite - Sighișoara – Schäßburg - Segesvár*





## D) Rediscovering wood-pastures?

### *The ancient wood-pasture of Mercheaşa – Streitfert - Mirkvásár*

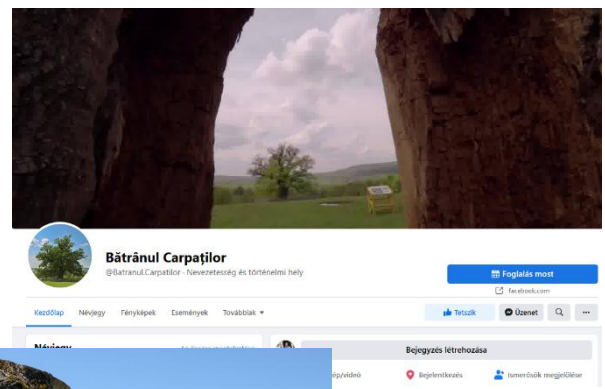


<https://arboriremarcabili.ro/ro/harta-si-arborii/arata-harta/>



# D) Rediscovering wood-pastures?

## The ancient wood-pasture of Mercheașa – Streitfert - Mirkvásár



<https://www.turismagement.ro/obiective-turistice/gorunul-secular-batranul-carpator-mercheasa-brasov-73/>



## D) Rediscovering wood-pastures?

### *The ancient wood-pasture of Mercheașa – Streitfert - Mirkvásár*



The screenshot shows the website banner for the Gorun Trail Mercheașa 2021 event. At the top left is the logo for Gorun Trail Mercheașa, featuring a green tree and a runner. To the right is a navigation menu with the following items: ACASĂ (highlighted in yellow), PROGRAM, TRASEU, ÎNSCRIERE, FAQ, CONCURENȚI, VOLUNTARIAT, and CONTACT. The main text on the banner reads "Gorun Trail Mercheașa 2021" in large white letters. Below this, a yellow bar contains the date "23 Octombrie, Mercheașa, Jud. Brașov". At the bottom of the banner, a white bar contains the text "Eveniment desfășurat în cadrul Geoparcului Carpaterra". The background of the banner is a photograph of several runners in a grassy field with trees in the distance.



<https://www.goruntrail.ro/>



# D) Rediscovering wood-pastures? *Colinele Transilvaniei*



**Colinele Transilvaniei**

@colineletransilvaniei · ★ 5 (20 vélemény) · Túraútvonal

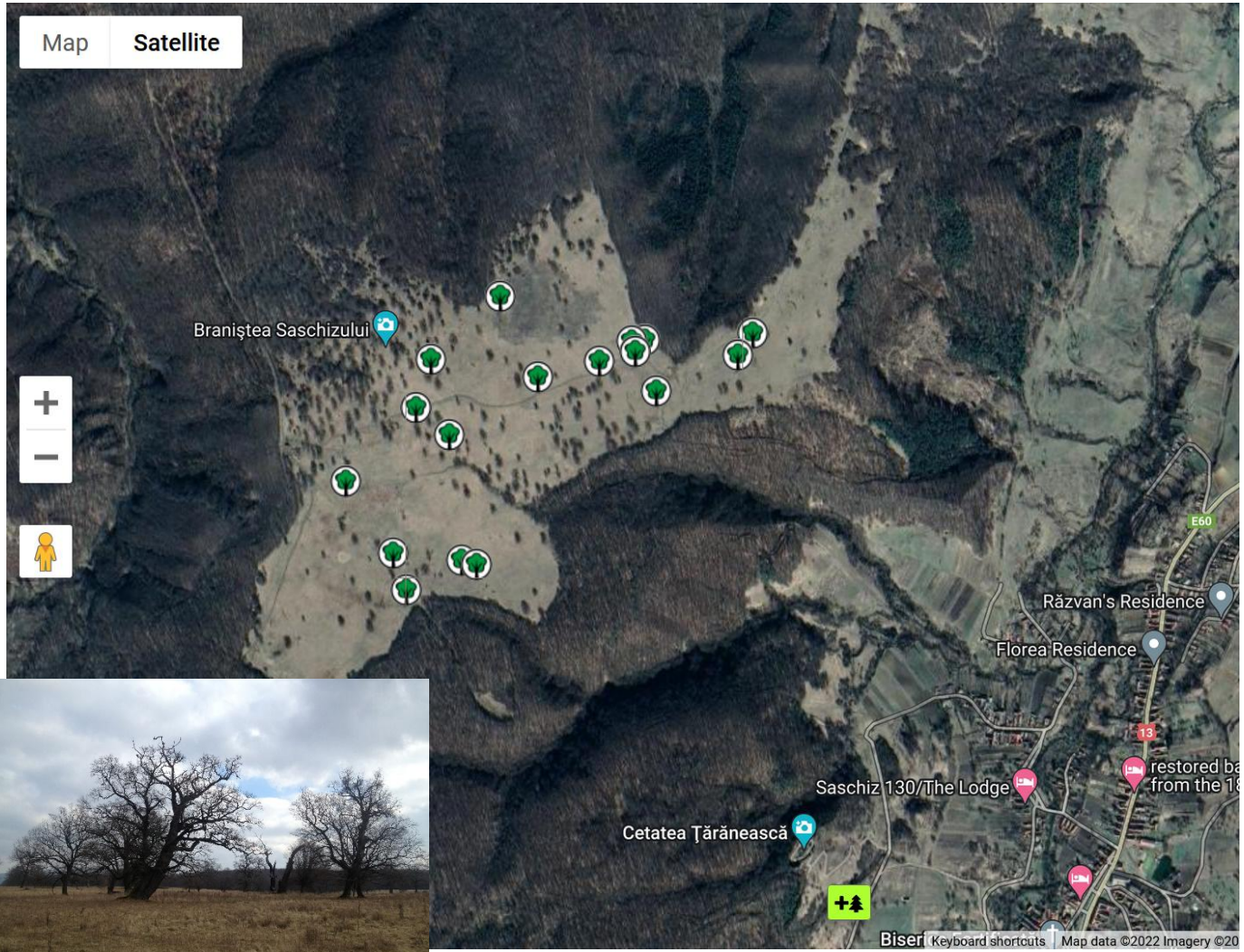
E-mail küldése





# D) Rediscovering wood-pastures?

*Muzeu Silvicultural – Silvicultural Museum – Saschiz – Kaest - Szászkézd*



<https://arboriremarcabili.ro/en/map-and-trees/show-map/>



# D) Rediscovering wood-pastures?

## Muzeu Silvicultural – Silvicultural Museum – Saschiz – Kaest - Szászkézd





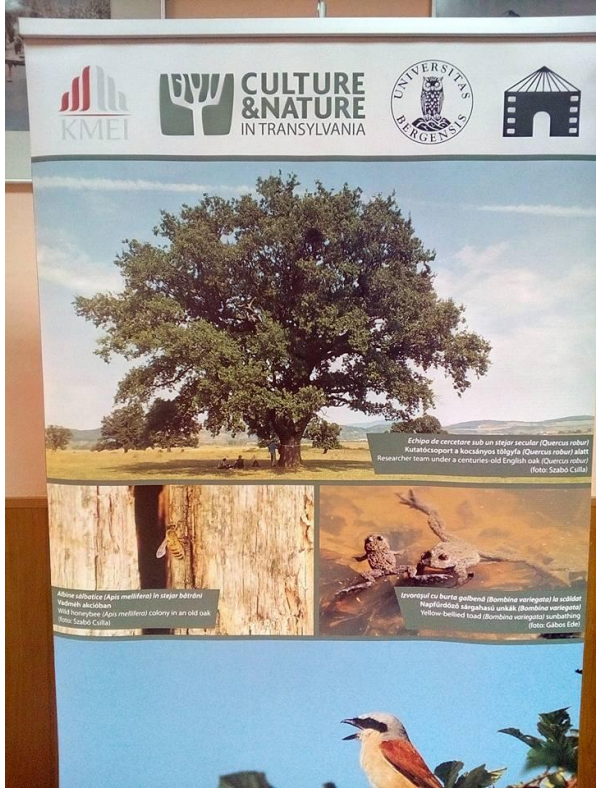
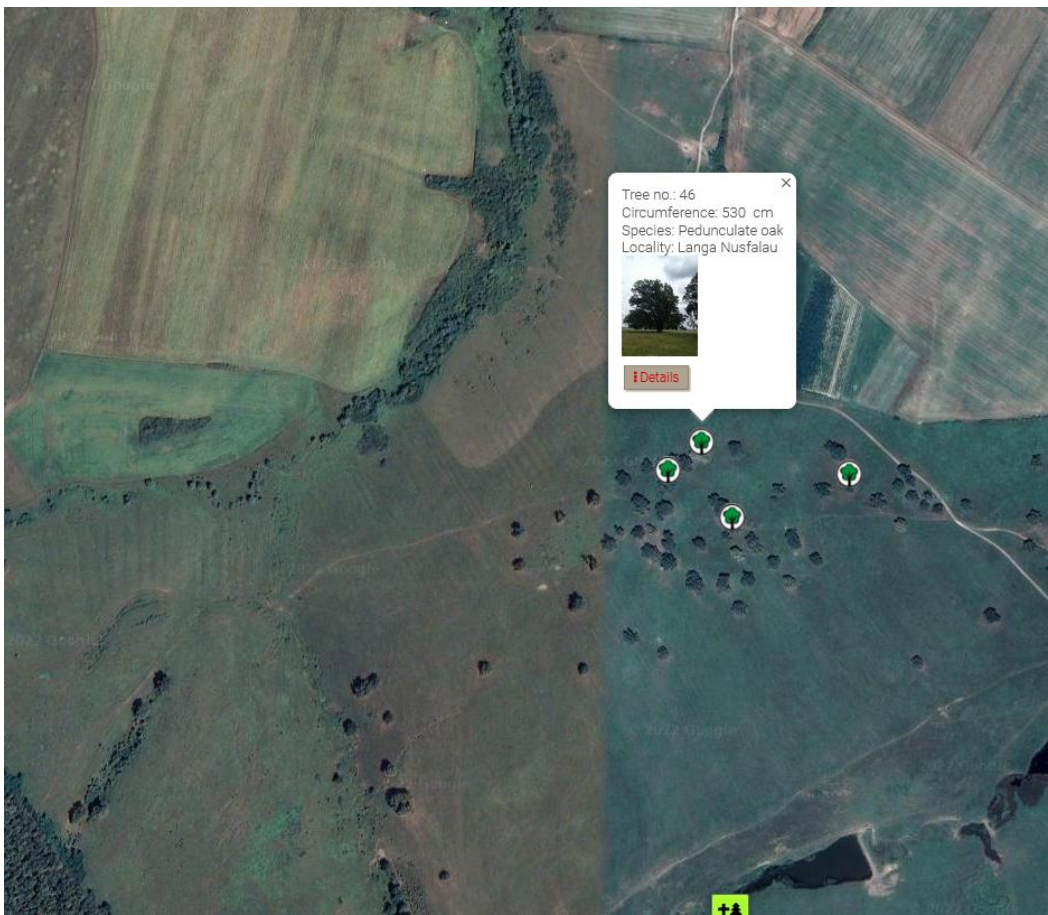
## D) Rediscovering wood-pastures? *Arts – Galeria Posibilă*





# D) Rediscovering wood-pastures?

## Culture and Nature Transylvania

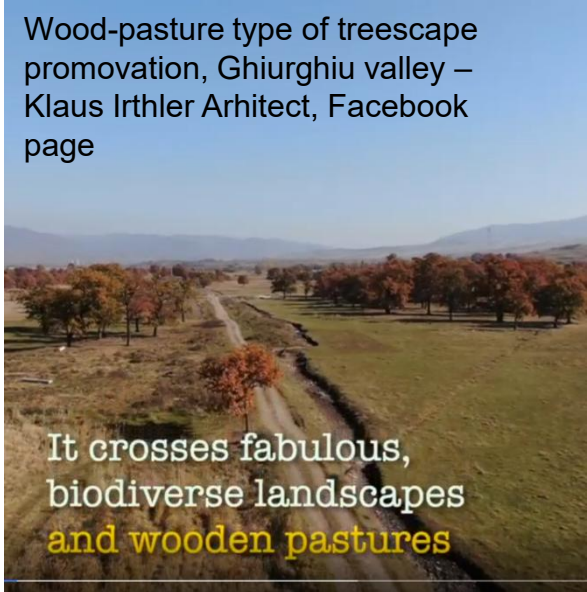


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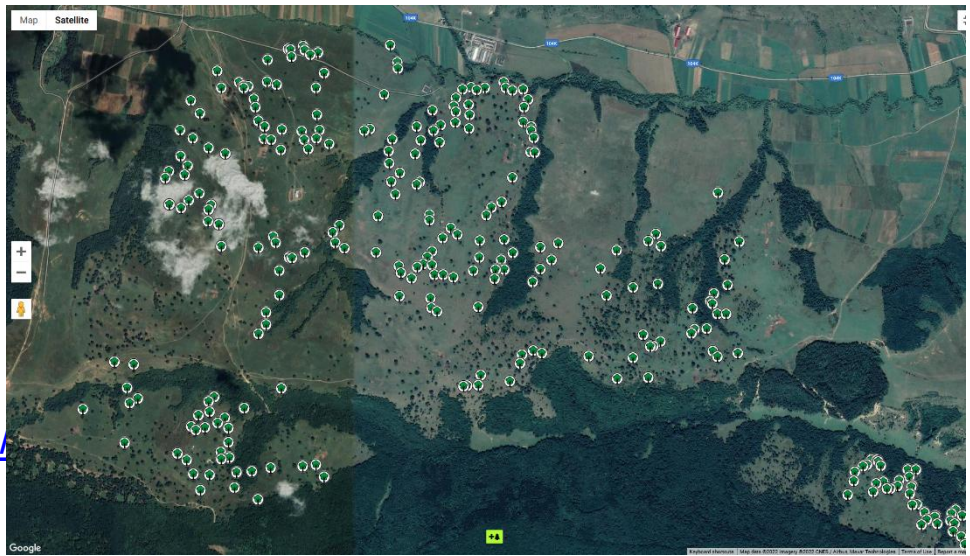


# D) Rediscovering wood-pastures?

## Several emerging recognitions across Transylvania



Local community representants from the village Şona visits the ancient oak wood-pasture of the nearby village, Ticuşu



<https://arboriremarcabili.ro/en/trees/show-map/>



## E) Policy lobby



### IMPEL Review Initiative (IRI) în domeniul conservării naturii, biodiversității și a ariilor protejate

În perioada 1-5 septembrie 2014, la comisarariatul Rezervației Biosferei Delta Dunării al Gărzii Naționale de Mediu s-a desfășurat IMPEL Review Initiative (IRI) în domeniul conservării naturii, biodiversității și a ariilor protejate, la care au participat experți din cadrul Comisiei Europene și autorități de mediu din Olanda, Italia, Malta, Anglia, Scoția, Macedonia, Cehia și România. Delegațiile au fost conduse, din partea GNM, de Szep Robert, comisar general adjunct, iar din partea IMPEL (Rețeaua Uniunii Europene pentru Implementarea și Impunerea Legislației de Mediu) de vicepreședintele Rețelei, Chris Dijkens.

*„Parteneriatul pe care autoritățile de mediu din România îl au cu rețeaua IMPEL este unul foarte important. Le-am propus partenerilor noștri, ca o colaborare pentru viitor, să abordăm împreună problematica ursului brun, să găsim împreună soluții cu privire la managementul acestei specii în adevăratul sens al cuvântului. O altă temă o reprezintă problema pajștilor cu arbori, un tip de peisaj nereglementat până acum, specific îndeosebi zonei săsești și secuiești din Transilvania. Valoarea deosebită din punct de vedere al biodiversității pe care îl are acest tip de peisaj este în pericol și suntem obligați să căutăm și să găsim soluții”, a apreciat ministrul Attila KORODI.*

Sesiunea finală a IMPEL Review Initiative (IRI) România a fost gazduită vineri, 5 septembrie, la sediul Ministerului Mediului și Schimbărilor Climatice, eveniment la care au participat Anne Jugănanu, Secretar de Stat în cadrul MMSC, Florin Diaconu – Comisar General al Gărzii Naționale de Mediu precum și reprezentanți ai conducerii GNM și ai MMSC.

Garda Națională de Mediu participă activ în Rețeaua IMPEL încă din 2004. Misiunea IMPEL este aceea de a contribui la protejarea mediului prin promovarea implementării și aplicării efective a legislației de mediu din UE.

*„Suntem convinși că această întâlnire, dincolo de o agendă punctuală, contribuie la împărtășirea experienței și a bunelor practici din domeniul protejării mediului, între numeroase instituții de mediu. România este una dintre țările europene care are norocul ca pe teritoriul său să aibă peste 23 de arii naturale protejate, așa că trebuie să gândim pe termen mediu și lung strategii pentru protecția și gestionarea acestor comori ale sale. Rolul Dumneavoastră și al Garzii Naționale de Mediu este să ne ajutați să putem implementa aceste strategii și să generăm metodologia necesară pentru a putea proteja aceste ecosisteme cât mai bine”, a subliniat Anne Jugănanu, Secretar de Stat în cadrul MMSC.*

La rândul său, Vicepreședintele Rețelei IMPEL, dl Chris Dijkens a mulțumit pentru invitația GNM de a prezenta preocupările instituțiilor de mediu ce activează în Rezervația Biosferei Delta Dunării. *„Este o zonă deosebit de importantă și veți vedea rezultatele acțiunilor voastre, veți vedea că faceți o treabă bună acolo și sunteți bine pregătiți. Delta Dunării este foarte importantă pentru România, dar reprezintă și un patrimoniu global. Am identificat multe măsuri foarte bune pe care le aplicați și care ar putea fi folosite și în cadrul IRI, de către alte state”.*

Printre aspectele care prezintă potențial de dezvoltare astfel încât legislația „verde” să fie implementată cât mai eficient este popularizarea, la nivelul UE, a rezultatelor și acțiunilor de succes ale GNM, aplicarea consecventă a unor amenzi care să oblige conformarea la cerințele legislației din domeniul mediului a celor care săvârșesc infracțiuni, astfel încât sa nu mai continue, instruirea și informarea judecătorilor privind legislația de mediu.

*„Ați avut o misiune importantă și vă mulțumim că ne apreciați munca de până acum. O să ținem cont de recomandările făcute și ne vom mai întâlni pentru a vă arăta cum am pus în practică cele discutate”, a conchis Comisarul General al Gărzii Naționale de Mediu, Florin Diaconu.*



# E) Policy lobby



European Commission

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### Europe's wood pastures: condemned to a slow death by the CAP?

Dates: 17 November 2015  
Location: European Parliament, Brussels, room ASP 3E2

**A test case for EU agriculture and biodiversity policy**

The event is organised by the [European Forum on Nature Conservation and Pastoralism](#), [Počány-havas Association](#) and [BirdLife Europe](#).

Not all pastures are just grass. In some regions of Europe, pastures are enriched by more diverse vegetation, including shrubs and trees, which provide additional forage for livestock and numerous environmental benefits. Ranging from grazed woodlands with complete tree canopy to grasslands scattered with irreplaceable ancient trees, these wood pastures are among the most valuable types of farmland for public goods.





Thanks for your attention

