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Book of abstracts

Integrated Management of Environmental Resources: challenges, tools and solutions

7th Edition of the Integrated Management of Environmental Resources Conference
Suceava – Romania

7-8 November 2025

Forestry Faculty, "Ștefan cel Mare" University
Suceava, Romania

Edited by:
Iulian Dănilă, Liviu Nichiforel, Ciprian Palaghianu, Gabriel Duduman

November 2025

Content

Conference Program

November 7th, 2025 - Friday

9.00 – 9.30	Registration of the participants, Aula E of the "Stefan cel Mare" University

Opening session – Aula E of the "Stefan cel Mare" University

09.30-10.30	Welcome speech - Ciprian Palaghianu, Dean, Forestry Faculty, "Ștefan cel Mare" University of Suceava - Mihai Dimian, Rector, "Ștefan cel Mare" University of Suceava Key messages from co-organizers - Mihai Androhovici, Association Sport for all Suceava: Placemaking for Climate Mitigation - Valerian Solovăstru, National Forest Administration RNP (Romsilva) Key messages from invited organizations

Plenary session - Aula E of the "Stefan cel Mare" University

10.30-11.00	Education and Practice in Environmental Resource Management: The Bucovina Forestry College Approach	Alina Cuciurean *Bucovina Forestry College Câmpulung Moldovenesc*
11.00-11.30	Wildlife Management Implications of Continuous Cover Forestry	András Náhlik[1,2] and Tamás Tari[2] *[1]Department of Life Sciences, Sapientia Hungarian University of Transylvania* *[2]Institute of Wildlife Biology and Management, University of Sopron*
11.30-11.50	Integrating Expert Knowledge into Citizen Science Approaches: Co-creating Forest Soil Knowledge in the ECHO Project	Ciprian Palaghianu, Ionut Barnoaiea, Alexei Savin, Cosmin Coșofreț *Forestry Faculty, Stefan cel Mare University of Suceava*
13.00 - 18.00	Panel & poster sessions - see detailed program for each session	

November 8th, 2025 - Saturday

9.00 - 14.00	Field trip to Slatioara old-growth forest UNESCO site

Session: Close to nature forestry — Room: E 109

Moderator: Gabriel Duduman

Oral presentations

13.00-13.20	Natural regeneration in virgin beech forests in the "Izvoarele Nerei" Reserve	Ilie Nicolae Ifca - *USV Regele Mihai I din Timisoara* Daniel Turcu - *INCDS Marin Dracea - Statiunea Timisoara* Florian Gh. Borlea - USV Regele Mihai I din Timisoara
13.20-13.40	Assessing the effect of proforestation on biomass stock in Iedera Living Lab	Cosmin Coşofreţ, Laura Bouriaud, Maximiliano Costa, Ionut Barnoaiea, Olivier Bouriaud *Forestry Faculty, Stefan cel Mare University of Suceava*
13.40-14.00	Close-to-nature forestry management measures for the Natura 2000 forest habitats from the Cheile Nerei – Beușnița National Park and the connected protected areas	Turcu D. O., Merce O., Ciontu C. I. *National Institute for Research and Development in Forestry „Marin Drăcea"*
14.00-14.20	Analysis of the conservation status of the 91E0* Community-Interest Habitats in UP II Brodina, Brodina Forest District, SPA Obcina Feredeului	Iulia Andreea Patraucean, Anca Măciucă *Forestry Faculty, Stefan cel Mare University of Suceava*
14.20-14.40	Gini index – a tool for the forest inventory	Gabriel Duduman *Forestry Faculty, Stefan cel Mare University of Suceava*
15.00-15.30	Coffee break	

Poster presentations

15.30-15.40	The structure of virgin stands, a model for restoring degrade stands	Vasile Ciprian *INCDS Marin Drăcea SCDEP Timișoara*
15.40-15.50	Effect of Light Availability and Ecological Gradients on Natural Regeneration within Old-Growth Sessile Oak-Beech Forest	Gruita Ienasoiu, Florin Lucian Toiu, Ion Catalin Petritan, Nicu Constantin Tudose, Lucica Catalina Toiu, Merce Oliver, Turcu Daniel-Ond, Mihai Fedorca, Any Mary Petritan, Cătălin-Constantin Roibu *INCDS Marin Dracea*

15.50-16.00	Adapted forest management for biodiversity conservation in mountain Norway spruce forests under climate change BIOFORMA project presentation	Gruita Ienasoiu, Any Mary Petritan, Tudose Nicu Constantin, Raul Gheorghe Radu, Mirabela Marin, Danut Chira, Nicolai Olenici, Gabi Lazar, Constantin Dumitru-Dobre, Cătălin-Constantin Roibu *INCDS Marin Dracea*
16.00-16.10	Environmental pressures and threats on protected natural ecosystems (case study: south-east of the Republic of Moldova).	Ala Donica[1], Viorica Angheluța[2], Iradion Jechiu[2], Rodica Cojocari[2] *[1]Laboratory "Natural and Anthropogenic Ecosystems", Institute of Ecology and Geography, State University of Moldova* *[2]Laboratory "Geography", Institute of Ecology and Geography, State University of Moldova*
16.10-16.20	Regional/local climate predictions for assessing the vulnerability of natural ecosystems to environmental changes (case study).	Rodica Cojocari, Ala Donica *Institute of Ecology and Geography, State University of Moldova*

Session: Environmental Economics and Policy — Room: E 105

Moderator: Laura Bouriaud

Oral presentations

13.00-13.20	Coping Mechanisms of Rural Households to Shocks: The Role of Socio-Economic Determinants and Strategies in Kakamega Forest, Kenya	Ibrahim Osewe, Nicolae Talpa, Bogdan Popa *Transilvania University of Brasov*
13.20-13.40	Needs, challenges and barriers faced by girls and young women in Romania for choosing a career in forestry	Cătălina Barbu, Ramona Elena Scriban *Stefan cel Mare University of Suceava*
13.40-14.00	Who cares for nature? Linking socio-demographic characteristics and environmental perceptions along Via Transilvanica	Medeea Halici[1,2], Laura Bouriaud[1] *[1]Stefan cel Mare University of Suceava* *[2]Botoșani County Museum, Natural Sciences Section*
14.00-14.20	Integrating tourist perceptions into sustainable forest management: evidence from the Via Transilvanica trail	Cerasela Teodorescu *Forestry Faculty, Stefan cel Mare University of Suceava*

14.20-14.40	Policy frames and legislative pathways for rewilding: A comparative analysis across eight European countries	Ionut Casian Balabașciuc, Laura Bouriaud, Liviu Nichiforel *Stefan cel Mare University of Suceava*
14.40-15.00	Economic Sustainability and Circular Economy: high hopes or low expectations?	Marian Drăgoi, Vasile Iacoban- Strîmbeanu, Tudor Artenie *Stefan cel Mare University of Suceava*
15.00-15.30	Coffee break	
15.30-15.50	National program for the expansion and rehabilitation of forests in the Republic of Moldova	Oxana Rusnac *Stefan cel Mare University of Suceava*
15.50-16.10	The Revision of Forest Management Plans: Beyond an Economic Perspective	Vasile Strîmbeanu - Iacoban, Marian Drăgoi *Stefan cel Mare University of Suceava*
16.10-16.30	Analysis of stakeholder perceptions in the development of the Romanian forestry code	Mariana Cenușă *Stefan cel Mare University of Suceava*
16.30-16.50	Assessing time-varying trends in the wood market as an indicator for environmental costs and impacts of forest management	Dragoș Costîn *Stefan cel Mare University of Suceava*

Poster presentations

17.00-17.10	Analysis of existing payment systems in Romania for promoting social forest services	Medeea Halici, Ionuț Balabașciuc, Cerasela Teodorescu, Laura Bouriaud *Stefan cel Mare University of Suceava*
17.10-17.20	Empowering communities to fight against desertification. A stakeholder decision.	Andrei Apăfăian, Diana Vasile, Mihaela Vieru, Vlad Crișan *INCDS "Marin Dracea" Brasov*
17.20-17.30	Can Siberian e lm (*Ulmus pumila* L.) and green ash (*Fraxinus pennsylvanica* Marshall) serve as key species in agroforestry systems developed in southern Romania?	Cristian Mihai Enescu *University of Agronomic Sciences and Veterinary Medicine of Bucharest*

Session: Certification and EUDR: Challenges, Tools and Solutions Room: E 106

Moderator: Liviu Nichiforel

Oral presentations

13.00-13.20	The Revised FSC Risk Assessment for Romania: Navigating Due Diligence and EUDR compliance	Florin Hălălișan[1], Bogdan Popa[1], Liviu Nichiforel[2], Ionuț Bârnoaiea[2], Nicolae Talpă[1], Ioan Vasile Abrudan[1] *[1]Transilvania University of Brasov* *[2]Forestry Faculty, Stefan cel Mare University of Suceava*
13.20-13.40	Assessing and Mitigating Systemic Risks: PPE Deficits and Fatal Accidents in Romanian Forestry Sector	Alexandra Popa *FSC (Forest Stewardship Council) Romania*
13.40-14.00	Sustainability advisory services - Getting ready for the EU Deforestation Regulation	Ramona Elena Scriban *Preferred by Nature*
14.00-14.20	Digitalization, interoperability, and innovation for compliance, transparency, and support smart business organization	Bogdan Buliga *Sustainability Today*
14.20-14.40	Preferred by Nature Certification – A tool for EUDR aligned Forest Management	Tudor Serban *Preferred by Nature*
14.40-15.00	Innovation in tree marking - the institutional conditions of technological development	Dorin Florențiu Pălie, Mihai Gășpărel, Laura Bouriaud *Forestry Faculty, Stefan cel Mare University of Suceava*
15.30-15.50	Comparative analysis of selling timber methods across ten European Countries	Liviu Nichiforel[2], Bogdan Popa[1], Florin Hălălișan[1], Nicolae Talpă[1] *[1]Transilvania University of Brasov* *[2]Forestry Faculty, Stefan cel Mare University of Suceava*
15.50-16.10	Verifying Forest Impacts for Integrated Environmental Resource Management	Alexandra Popa *FSC (Forest Stewardship Council) Romania*

Poster presentations

16.10-16.20	How occupational health and safety is approached in the forestry sector: Aspects and risk factors in work activities	Ruxandra Georgiana Postolache *Stefan cel Mare University of Suceava*

Session: Forest Assessment, Modelling, Forest Management and Forest Health

Room: E230

Moderator: Mihai-Leonard Duduman

Oral presentations

13.00-13.20	Propagation of uncertainty from input data into EFISCEN-Space projections: A case study of Romanian forests	Ioan Dutca, Raul Radu *Transilvania University of Brasov*
13.20-13.40	Using terestrial land surveying and aerial laser scanning to assess the eficiency of ecological reconstruction - Balaceana ravine	Ionut Barnoaiea, Gabriel Duduman, Cosmin Coşofreţ, Ovidiu Iacobescu, Ioan Ciornei *Forestry Faculty, Stefan cel Mare University of Suceava*
13.40-14.00	The climate change and the evolution of *Lymantria monacha* population in Romania	Dragoș Toma, Gabriela Isaia, Constantin Nețoiu *Transilvania University of Brasov*
14.00-14.20	The Spruce Bark Beetle Situation in Romania's Forests managed by State Forest Administration: A Look at the Last 10 Years (2015-2024)	Mihai-Leonard Duduman[1]; Nicolai Olenici[2]; Constantin Nețoiu[2] [1]*Forestry Faculty, Stefan cel Mare University of Suceava* [2]*INCDS Marin Drăcea*
14.20-14.40	Pasture overuse in the Naryn region of Kyrgyzstan and plague circulation	Ibrayeva Nasgul, Beishembaeva Zhibek, Zumagulov Rakhat, Yusupov Ravil *Issyk-Kyl state university*
14.40-15.00	Cormophyte flora of the Făgetul Dragomirna reservation in Suceava county	Cezar Valentin Tomescu, Cătălina Barbu, Gabriel Duduman *Forestry Faculty, Stefan cel Mare University of Suceava*
15.30-15.50	Influence of the terrain slope, bedrock lithology and soil depth on the soil erosion processes of tractor roads from the forest area of the Stanisoara Mountains, Suceava County, Romania	Alexei Savin, Alexandru-Sebastian Arsinte *Forestry Faculty, Stefan cel Mare University of Suceava*
15.50-16.10	Restoration of 2nd-3rd generation Acacia stands in the Republic of Moldova	Dionisie Cojocari *Forestry Faculty, Stefan cel Mare University of Suceava*
16.10-16.30	*Stellario nemorum-Alnetum glutinosae* Lohmeyer 1957 association, matteuccietosum struthiopteris (Turcu 1970) sub-association Oroian 1998 in the vicinity of the Făgetul Dragomirna reserve	Cezar Valentin Tomescu, Irina Irimia *Forestry Faculty, Stefan cel Mare University of Suceava*

Poster presentations

16.30-16.35	Unveiling sustainable operating spaces for European forests - the SOSFOR project	Westhauser A., Sperlich D., Vacchiano G., Vizarri M., Oggioni S.D., Brocco S., Alberica O.M.M., Sanz A., Esteban E., Zarauz I., Jiménez-Caballero P., Curtu A.L., Popa B., Popa A.*, Besliu E., Hapa M., Eyvindson K., Nahorna O., Hanewinkel M.
16.35-16.40	Using GIS Techniques to Identify Suitable Land for Afforestation: A Case Study of Cimișlia District, Republic of Moldova	Gheorghe Florență, Veronica Florență *Institute for Forest Research and Design Chisinau, Republic of Moldova*
16.40-16.45	Improving UAV Survey Accuracy in Mountain Forests Using Local GNSS RINEX Corrections"	Bogdan Popovici – *Stefan cel Mare University of Suceava*; Raffaele Pelorosso – *DAFNE Department, Tuscia University, Italy*; Mihai Avădanei - *University of Petrosani*; Cătălin Lixăndroiu - *Technical University of Civil Engineering Bucharest*; Cătălin Joița – *GISCAD*
16.45-16.50	MikeShe application in torrential runoff dynamics through the lens of land use change. Case study: Tigai basin - Tarlung reservoir (Brasov - Romania)	Alin Lucian Mihalache, Nicu Constantin Tudose, Cezar Ungurean, Mirabela Marin, Radu Raul, Maria Ilinca Cheveresan, Mihai Stancu, Nicoleta Popescu *National Institute for Research and Development in Forestry "Marin Dracea"*
16.50-16.55	Digital forestry: technologies, advantages, and perspectives for modern forest management	Iulian-Constantin Dănilă, Ciprian Palaghianu *Forestry Faculty, Stefan cel Mare University of Suceava*
16.55-17.00	Contributions to the forest habitats study of the "Vila Nisporeni" Emerald site	Aliona Miron [1], Alexandru Galupa[1], Ala Donica[2], Serghei Tonofrei[2], Cristina Brașoveanu[2] *[1]Forest Research and Management Institute, Chisinau, Republic of Moldova;* *[2]Institute of Ecology and Geography of the State University of Moldova, Chisinau, Republic of Moldova.*
17.00-17.05	The role of botanical studies on land designated for afforestation within the National Forest Expansion and Rehabilitation Program (2023-2032) (on the example of the Cimislia Silvo-Cinegetic Enterprise)	Aliona Miron[1,2], Alexandru Galupa[1,2], Marina Popova[3] - *[1]Forest Research and Management Institute, Chisinau, Republic of Moldova* *[2]"Alexandru Ciubotaru" National Botanical Garden (Institute) of the State University of Moldova, Chisinau, Republic of Moldova*

		[3]*Cimislia Silvo-Cinegetic Enterprise, Cimislia, Republic of Moldova*
17.05-17.10	Phenotypic variation in native and introduced *Quercus* species: insights from a common garden experiment at Hemeius Arboretum	Ioana Maria Pleșca[1], Ecaterina Nicoleta Apostol[1], Bogdan Ionut Plesca[1,2], Robert Cristian Ivan[1,2], Cosmin Constantin Loghin[1,2], Aliona Miron[3,4], Ion Roșca[4], Ovidiu Badea[1,2] [1]*National Institute for Research and Development in Forestry "Marin Drăcea", Voluntari, Romania* [2]*Transilvania University, Faculty of Silviculture and Forest Engineering, Brasov, Romania)* [3]*Forestry Research and Management Instiute, Chisinau, Republic of Moldova,* [4]*"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova*
17.10-17.15	Foliar chlorophyll index of oak species in relation to environmental factors in the Romanian silvosteppe	Bogdan-Ionuț Pleșca[1,2], Cosmin Constantin Loghin[1,2], Ioana-Maria Pleșca[1], Dan Marian Gurean[2], Ovidiu Badea[1,2] [1]*National Institute for Research and Development in Forestry "Marin Drăcea", Voluntari, Romania* [2]*Transilvania University, Faculty of Silviculture and Forest Engineering, Brasov, Romania*
17.15-17.20	New record of the *Sternbergia colchiciflora* Waldst. et Kit. in the spontaneous flora of the Republic of Moldova	Olga Ioniță, Aliona Miron, Alexandru Galupa *"Alexandru Ciubotaru" National Botanical Garden (Institute) of the State University of Moldova, Chisinau, Republic of Moldova*
17.20-17.25	IT4EST project	Valentin - Emil Dinu *Ocolul Silvic "Vlăsia" S.R.L.*
17.25-17.30	Holisoils Project (Holistic management practices, modelling and monitoring for European forest soils): Insights from the Romanian forest soil test site	Ion Catalin Petritan[1], Ioan Dutca[1], Leticia Pérez-Izquierdo[2], Tijana Martinovic[3], Jorge Curiel-Yuste[2] [1]*Faculty of Silviculture and Forest Engineering, Transilvania University of Brasov, Romania* [2]*BC3-Basque Centre for Climate Change, Scientific Campus of the University of the Basque Country, Leioa, Spain* [3]*Laboratory of Environmental Microbiology, Institute of Microbiology of the Czech Academy of Sciences, Praha 4, Czech Republic*

Session: Forest Ecosystems and Climate **Room: E132**

Moderator: Cătălin Constantin Roibu

Oral presentations

13.00-13.20	Shifts in steppe and forest-steppe phytoclimatic zone boundaries in southern and southeastern Romania (1961–2020)	*Constantin-Cosmin Loghin[1,2], Corina Enache[1], Florin Achim[1], Nicolae Ovidiu BADEA[1,2]* *1National Institute for Research and Development in Forestry "Marin Drăcea", Voluntari, Romania;* *2Faculty of Silviculture and Forest Engineering, "Transilvania" University of Braşov, Braşov, Romania;*
13.20-13.40	A Carbon Monitoring Framework for 'Kremenetski Hory' National Park in Ukraine	Ihor Buksha, Volodymyr Pasternaka, Tetiana Pyvovar, Taras Buksha *Ukrainian research institute of forestry and forest melioration named after G.M. Vysotsky*
13.40-14.00	Tree-ring-based mapping of oak bioregions in forests of Eastern Romania: A key step in assessing forest vulnerability to climate change.	Andrei Mursa, Ciprian Palaghianu, Marian-Ionuț Stirbu, Mihai-Gabriel Cotos, Viorica Nagavciuc, Cosmin-Mihai Andriescu, Maria-Ecaterina Asandei, Victor Sfecla, Catalin-Constantin Roibu *Forestry Faculty, Stefan cel Mare University of Suceava*
14.00-14.20	The relation between NDVI and Tree-Ring Width of *Picea abies* (L.) from Eastern Carpathians, considering the influence of local climate conditions induced by elevation	Emilian Stoica[1], Ionel Popa[2], Andrei Popa[2] *[1]Forestry Faculty, Stefan cel Mare University of Suceava* *[2]National Institute for Research and Development in Forestry "Marin Drăcea"*
14.20-14.40	A protocol for high-quality slides for coniferous tree-ring anatomy	Asandei Maria-Ecaterina, Știrbu Marian-Ionuț, Mursa Andrei, Andriescu Cosmin-M., Cotos Mihai-Gabriel, Roibu Cătălin-Constantin *Forestry Faculty, Stefan cel Mare University of Suceava*
14.40-15.00	Four centuries of temperature variability revealed by tree-ring proxies of *Pinus cembra* from the Retezat Mountains	Știrbu Marian-Ionuț, Roibu Cătălin-Constantin, Mursa Andrei, Cotos Mihai-Gabriel, Andriescu Cosmin-Mihai, Asandei Maria-Ecaterina, Popa Ionel *Forestry Faculty, Stefan cel Mare University of Suceava*
15.00-15.30	Coffee break	

15.30-15.50	The influence of climate change on oak trees within the Strășeni Forestry and Hunting Entity	Grati V.[1,2], Railean V.[2], Bejan Iu.[2], Roibu C-C[1] *[1]Forestry Faculty, Stefan cel Mare University of Suceava* *[2]Universitatea de Stat din Moldova,*
15.50-16.10	The current state of the clay properties in Barskoon, Issyk-Kul region, in the context of climate change.	Asanbekova Ch.A.,Osmonbaeva K.B., Zhamaev A.K., Ibraeva K.B. *Issyk-Kul State University named after K. Tynystanov*
16.10-16.30	Structure and dynamics of radial growth in a pedunculate oak (*Quercus robur* L.) stand in the Cărpineni Forest District	Victor Sfeclă[1,2], Irina Sfeclă[1], Alexei Josan[1,2], Andrei Mursa[2], Catalin-Constantin Roibu[2] *[1]Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences* *[2]Forestry Faculty, Stefan cel Mare University of Suceava*
16.30-16.50	Dendrometric and Auxological Research in Poplar Riparian Stands from the Prut River Floodplain	Sergiu-Georgian Cîrlig, Cătălin-Constantin Roibu *Forestry Faculty, Stefan cel Mare University of Suceava*

Poster presentations

16.50-16.55	Placemaking for Climate Mitigation	Mihai Androhovici, Anca Oana Serediuc *Association Sport for all Suceava*
16.55-17.00	Oak species dendroclimatic patterns and resilience to drought in South-Eastern Romania	Andrei Popa, Ionel Popa *National Institute for Research and Development in Forestry "Marin Drăcea"*
17.05 – 17.10	Biological implications on *Lumbricus terrestris* communities in soil polluted with heavy metals	Adelina Ecaterina Bantaș, Corneliu Mihăiță Pohonțu *Forestry Faculty, Stefan cel Mare University of Suceava*
17.10 – 17.15	Evaluation of contamination by heavy metals through bioaccumulation and biomagnification in the avifauna of the Fălticeni area	Emilian Stoica, Corneliu Mihăiţă Pohonţu, Ionuţ Barnoaiea *Forestry Faculty, Stefan cel Mare University of Suceava*
17.15 – 17.20	Response of Japanese larch (*Larix leptolepis* Gord) radial growth to climate change in the Left-Bank forest-steppe, Ukraine	Iryna Koval[1], Nadiya Maksymenko[2], Nadiya Cherkashyna[2], Vadym Gololobov[2], Olena Andreieva[3]

		1G. M. Vysotsky Research Institute of Forestry and Forest Melioration, Kharkiv, Ukraine *2V. N. Karazin Kharkiv National University, Kharkiv, Ukraine* *3Polissya National University, Zhytomyr, Ukraine* *Affiliation*
17.20 – 17.25	Preliminary results regarding the current characteristics of forest sites in the forest-steppe and plain areas of the Ialomița River floodplain	Mihăiță Bîtcă[1,2], Dorina Drăgan[1], Florin Dănescu[1], Adrian Tudora[1,3], Elena Mihăilă[1], Gabriel Duduman[2] *[1]National Institute for Research and Development in Forestry "Marin Dracea", Bucharest, ROMANIA* *[2]Faculty of Forestry, Ștefan cel Mare University of Suceava, Romania* *[3]Transilvania" University of Brasov, Forestry of Silviculture and Forest* *Engineering, Brasov, Romania*
17.25 – 17.30	Forest aridity stress index - interpretation and application (case study: the Dniestre forest-steppe plateau)	Ala Donica, Nicolae Grigoraș, Cristina Brașoveanu *Institute of Ecology and Geography, Moldova State University*
17.30 – 17.35	Ecological valence and toxi-tolerance of edifying tree species in urban green spaces from the Republic of Moldova.	Valeriu Brașoveanu, Nicolae Grigoraș *Institute of Ecology and Geography, State University of Moldova*
17.35- 17.40	*Carici Pilosae-Carpinetum Betuli* Neuhausl et Neuhauslova-Novotna 1964 (Carpinion Betuli Issler 1931) in the "Dobrușa" landscape reserve, Republic of Moldova	Victor Sfeclă[1,2], Pavel Pînzaru[2,3] *1Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences* *2Doctoral School of Natural Sciences, MSU* *3"Alexandru Ciubotaru" National Botanical Garden (Institute), MSU*
17.40- 17.45	Some aspects of stand structure and growth dynamics in a Black Pine (*Pinus nigra*) stand in the Zloți Forest District	Alexei Josan [1,2], Victor Sfeclă[2] *[1]"Ștefan cel Mare" University of Suceava, Forest Biometrics Laboratory, Faculty of Forestry* *[2]Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences*
17.45- 17.50	Growth and adaptive potential of *Pinus cembra* in a common garden experiment in the South-Eastern Carpathians	Mihai Bogdan Fănățan, Elena Ciocîrlan, Alexandru Lucian Curtu *Transilvania University of Brasov*

Wildlife Management Implications of Continuous Cover Forestry

András NÁHLIK[1,2], Tamás TARI[2]

[1]Department of Life Sciences, Sapientia Hungarian University of Transylvania, Romania;
[2]Institute of Wildlife Biology and Management, University of Sopron, Hungary.
E-mail: nahlikandras@uni.sapientia.ro

The Hungarian Forest Act distinguishes three types of forest management systems: even-aged, ending with final felling; transformation; and continuous cover forestry systems. Although the law does not prescribe the pace or extent of transitioning to continuous cover forestry at the forest enterprise level—typically involving an intermediate transformation phase—professional guidelines and strategic objectives increasingly encourage such structural changes, especially in state-owned forests, for ecological, conservation, and climate-related reasons. The Pro Silva association, founded and led by forest engineers, plays a growing role in advocating the adoption of continuous cover forestry. However, achieving this management system through transformation poses considerable challenges for foresters, particularly in oak stands, and most notably in lowland pedunculate oak forests. Limited natural regeneration, dense ground and shrub layers, damage caused by cockchafer (*Melolontha melolontha*) larvae and oak powdery mildew (*Erysiphe sp.),* and the strong preference of ungulates for acorns and oak seedlings over beech all hinder successful implementation.
The aim of our study was to investigate:
(i) the quantity and quality of natural forage available to ungulates in different, previously unexamined forest management systems and stand types;
(ii) the effects of transformation and continuous cover forest structures on the dispersion and habitat selection of ungulates;
(iii) the role of ungulates in maintaining continuous forest cover (whether inhibiting, beneficial, or neutral); and
(iv) the browsing intensity of large herbivores in transformation gaps under varying population densities.
Our findings indicate that:
1. The young age classes of even-aged forests provide greater biomass availability than continuous cover forests, while middle-aged and mature classes offer less. Assuming an even age-class distribution, however, continuous cover forests yield a higher overall average forage supply;
2. Despite this, red deer, roe deer, and wild boar used even-aged forests more intensively than continuous cover forests. This was primarily due to the use of thicket stage stands as shelter rather than for feeding, while continuous cover forests provided less cover;
3. Exclusion experiments revealed that excluding large herbivores does not necessarily promote natural regeneration in gaps. When red deer were excluded, blackberry cover increased and, through shading and root competition, often suppressed oak seedlings. Although browsing intensity on open sites was moderate (around 20%), the average height of oak seedlings there remained lower than within fenced plots;
4. Camera trap data showed that transformation gaps were most frequently used by red deer, which foraged in these microhabitats in about half of the recorded cases, often feeding on regenerating vegetation.

Integrating Expert Knowledge into Citizen Science Approaches: Co-creating Forest Soil Knowledge in the ECHO Project

Ciprian PALAGHIANU, Ionut BĂRNOAIEA, Alexei SAVIN, Cosmin COȘOFREȚ

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: cpalaghianu@usm.ro

Soil represents a vital natural resource and a key component of environmental quality, alongside water and air. However, soil quality is inherently more complex than that of air or water because the soil is a living system that sustains a wide array of natural processes and production activities. The concept of soil quality has evolved in response to the current focus on sustainable land use, reflecting a holistic understanding that sustainability must extend beyond simply controlling soil erosion or pollution.

Soil sampling and analysis are widely employed across local, regional, and national scales to assess soil status and use potential. Nevertheless, selecting appropriate soil attributes and interpreting measurements remain challenging tasks. These difficulties arise from the high spatial variability of soils, the site-specific legacy effects of past land use, and the trade-offs between ecosystem services. Within the ECHO project, we aim to advance the assessment of soil health and improve the conceptual understanding of this notion, particularly in relation to indicator selection and assessment methodologies. Co-funded by the European Union through the Horizon Europe Framework Programme for Research and Innovation, the ECHO Project seeks to engage citizens in protecting and restoring soils by enhancing their skills and knowledge. The project empowers citizen-scientists to participate in local soil data collection, contributing to the creation of ECHOREPO — an extensive, open-access European database on soil health. To facilitate citizen-based data collection, we identified the most frequently used soil quality indicators across different land-use types.

Based on a comprehensive review of the scientific literature, we selected a broad range of chemical, physical, and biological indicators. While numerous physical and chemical parameters focus primarily on soil quality, a robust soil health assessment also requires the evaluation of biological attributes. However, a significant scarcity of data remains regarding biological indicators of soil health and the integration of physical, chemical, and biological soil properties with current management practices.

To address this gap, we consulted soil experts from diverse backgrounds, including academia, research, education, and land management, to ensure a balanced perspective that spans both agricultural and forest ecosystems. We concluded that the explicit evaluation of soil quality in relation to specific soil threats, soil functions, and ecosystem services is essential, and that the selected indicators should meet several key criteria, including accuracy, consistency, and accessibility. Furthermore, we emphasise the importance of integrating new biological indicators, particularly soil metagenomic (DNA-based) analyses, along with other currently underused links between indicators that reflect essential soil processes and their spatial integration within the landscape.

Maintaining soil health requires the collaboration of diverse stakeholders — from scientists and policymakers to practitioners and citizens — to bridge the gap between knowledge and practice, and to increase societal awareness of soil's critical role. Finally, soil data must be "democratised", ensuring open access to information for a broad range of stakeholders. Making this information accessible will foster informed decision-making and encourage more involvement in activities aimed at protecting and restoring soil health.

Natural regeneration in virgin beech forests in the "Izvoarele Nerei" Reserve

Ilie Nicolae IFCA[1], Daniel-Ond TURCU[2], Florian Gh. BORLEA[1]

[1]USV Regele Mihai I, Timişoara, Romania;
[2]National Institute of Research - Development in Forestry *"Marin Dracea",* Timişoara, Romania.
E-mail: nicolaeifca@gmail.com, fborlea@yahoo.com

The virgin beech forests in the "Izvoarele Nerei" Reserve constitute a representative model of a forest ecosystem where natural dynamics occur without direct anthropogenic influence. Regeneration processes are controlled both by internal factors, such as the local microclimate, the age structure, the presence of dead wood, and the formation of gaps in the canopy, and by external factors, related to altitude, exposure or soil water regime. In the absence of silvicultural intervention, natural regeneration constitutes the essential mechanism by which these forests maintain their composition, structure, and ecological functions in the long term.
Representative of the ecological diversity of the reserve, the permanent sample plots stratified by altitude were delimited and considered representative of the ecological diversity of the reserve. Within these plots, all trees and saplings with a diameter of less than 8 cm were inventoried and grouped by diameter and height classes. Additionally, data were collected on the positioning relative to the canopy gaps, the thickness of the litter layer, the presence of dead wood, and traces of herbivory.
Preliminary research conducted in the “Izvoarele Nerei“ Reserve generally confirms the conclusions of various authors who have studied virgin forests. Natural regeneration in this reserve is overwhelmingly dominated by beech (*Fagus sylvatica*), with average densities estimated at 2747 - 30269 thousand individuals/ha, depending on microstationary and altitude conditions. Mixed species, such as mountain sycamore (*Acer pseudoplatanus*) or fir (*Abies alba*), appear sporadically, especially below 1,000 m altitude, representing less than 1% of the total number of specimens. The vertical distribution of seedlings highlights a significant concentration in the lower height classes (<10 cm), with a gradual reduction towards the higher classes. This "pyramid" structure suggests a continuous installation of new individuals, accompanied by high mortality in the juvenile stages. From a compositional point of view, the dominance of beech confirms the natural monocoenosis character specific to virgin forests in the Banat Montan, but the occasional appearance of companion species indicates the existence of small-scale ecological niches.
Spatial analysis showed that saplings are concentrated in the vicinity of canopy gaps and in areas with dead wood in decomposition. In contrast, sample areas with a litter layer thicker than 7 cm or with dense moss cover or estimated low regeneration densities.
From monitoring of sapling cohorts over 2–3 years, high mortality rates were estimated in individuals under 50 cm, most likely caused by water deficit and competition for light. Trees exceeding 100 cm in height showed a higher probability of integration into the young layer of the stand. Signs of turning were frequently recorded in saplings under 50 cm, with variable intensity depending on the pressure of cervid populations.
In conclusion, natural regeneration in virgin beech forests in “Izvoarele Nerei“ is characterized by a pyramidal structure typical of virgin forests, dominated by beech and maintained through natural processes such as gap formation and deadwood cycling. The observed dynamics are comparable to the patterns reported in other virgin beech forests in the Carpathians and Central Europe, where light, substrate, and herbivore pressure are the main controlling factors.

Assessing the effect of proforestation on biomass stock in Iedera Living Lab

Cosmin COŞOFREŢ, Laura BOURIAUD, Maximiliano COSTA, Ionut BARNOAIEA, Olivier BOURIAUD

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: cosmin.cosofret@usm.ro

Leaving forests unmanaged and allowing them to regenerate on their own accord is a rewilding approach known as proforestation. Without requiring any investments or human effort, proforestation can create some of the most biomass-dense and biodiverse terrestrial ecosystems in Europe.
Also, the capacity of rewilded forests to resist and adapt to future climatic trends and extreme events, such as windstorms, is already estimated for Europe's primeval forests and strict forest reserves.
In the context of 10% strict protection, is proforestation suitable for every managed forest?
Therefore, in the Iedera living lab, a managed forest dominated by *Fagus sylvatica, Quercus petraea* and *Tilia cordata*, we simulated the effect of proforestation and extreme wind events to analyze the evolution of aboveground biomass in the different climate scenarios (RCP2.6, RCP4.5, RCP8.5).
The results show that, in the context of halting management and in the moderate and extreme climate scenarios, *Tilia cordata* will become an invasive, dominant tree species, altering the composition and biomass stock. Also, the biomass stocks are negatively affected by the extreme climate scenarios.
In this case study, where *Fagus sylvatica* is at its eastern distribution limit, proforestation has led to its decline in extreme climates. Therefore, to keep *Fagus* and *Quercus petraea* for another 20-30 years, management should focus on harvesting Tilia while planting tree species adapted to drier conditions alongside existing species.
In conclusion, selecting forests where to promote proforestation should be done after checking the future suitability of the existing species.

Close-to-nature forestry management measures for the Natura 2000 forest habitats from the Cheile Nerei – Beușnița National Park and the connected protected areas

Daniel-Ond TURCU, Oliver MERCE, Cătălin CIONTU

National Institute of Research - Development in Forestry *"Marin Dracea", Timișoara, Romania.*
E-mail: daniel.turcu@gmail.com

During 2022-2025, a new Management Plan was issued for the Cheile Nerei Beusnita National Park and the associated protected areas, a total surface of 37720.90 ha being investigated at the level of the Natura2000 Cheile Nerei Beusnita Site of Community Importance.
Ten Natura2000 forest habitats were mapped and described in the field, most of them being edified by the European beech.
24 current pressures were identified: planting of non-native trees, inadequate forestry activities/interventions, fragmentation of the habitats by roads and other infrastructure elements, domestic animals grazing, abandonment of garbage, unsustainable tourism, etc. Four future threaths were also described.
In order to preserve or to enhance the conservation status of the forest habitats, 13 management measures were issued, most of them based on or integrating close-to-nature forestry principles: preventing the conversion of the natural habitats into intensive forestry plantations, restriction of planting non-native species, verification of the implementation of technical norms ragarding forestry opperations, control of the invasive species, etc.

Analysis of the conservation status of the 91E0* Community-Interest Habitats in UP II Brodina, Brodina Forest District, SPA Obcina Feredeului

Iulia-Andreea PATRAUCEAN, Anca MĂCIUCĂ

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: anca.maciuca@usm.ro

The objective of this study was to assess the conservation status of the 91E0* community-interest habitat type – *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior** (Alno-Padion), taking into account its ecological value and its contribution to maintaining the diversity and favorable conservation status of the bird species for which the Special Protection Area ROSPA0089 "Obcina Feredeului" was designated. This habitat type fulfills multiple ecological functions and provides essential ecosystem services.

In the initial phase of the study, all thirty forest compartments containing this habitat type within UP II Brodina, Brodina Forest District, SPA Obcina Feredeului, were identified. Subsequently, during field surveys, individual assessment were completed for each compartment, following the European methodology for determining habitat conservation status.

Based on the analysis of the data concerning the biotope, biocenosis, disturbance factors, and conservation condition of these habitats, differentiated management measures were proposed. These measures are intended, as appropriate, to maintain or improve the overall conservation status of the targeted habitats.

Gini index – a tool for the forest inventory

Gabriel DUDUMAN

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: gduduman@usv.ro

Context: Forests represent an important resource at a global level and, whatever priorities are set for forest management, it is necessary to determine its characteristics as accurately as possible. Even though trees and forest characteristics can be assessed either from the ground or from the air, ground-based measurements will probably be used in the future at least for the calibration of newly developed techniques and equipment. At the moment, most often, forests are statistically inventoried, but the statistical inventories must first be designed so as to properly determine the number, size and shape of the inventory plots and the distance between their centres. These elements significantly influence the efficiency and cost of inventory. For this reason, in order to reduce inventory effort, the inventory shall be sized appropriately, without affecting the final result. The defining elements of statistical inventory, especially the density and size of inventory plots, depend greatly on the dimensional diversity of the trees within a forest stand, or stands' heterogeneity within a forest. Thus, before carrying out a statistical inventory, a preliminary assessment of the dimensional diversity of the trees should be carried out in the stands to be inventoried. Gini index can be employed successfully in this regard.
Goal: Thus, the research goal in this study is to analyse how trees dimensional diversity stabilizes in forests with different structural characteristics, in relation to the size of the inventory plot, respectively with the increase in the number of inventoried trees within an inventory plot, so that this information can then be used in the design of the statistical forest inventory.
Method: The research was carried out in Romania, in natural and cultivated mixed stands with coniferous and beech located in low mountains, similar site, soil and forest type, but having different structural characteristics, as a result of the application of a different type of forest management. Thus, 17 rectangular inventory areas (IAs) were established, where all living trees exceeding a dbh of 10 cm were measured, resulting a total of 3815 trees from a total inventoried area of 9 ha. Based on the fact that, for efficiency reasons, statistical forest inventory usually works with circular plots, whose size does not exceed 1250 m2, reference trees (RTs) were identified within IAs in order to become the centre points of circular inventory plots (CIPs). Different concentric CIPs were established for each RT, with areas successively increased, by adding the closest neighbour tree to the already existing trees in a previously established CIP. For each CIP, the Gini index was calculated to identify the number of trees at which the Gini index stabilizes at the CIP level.
Results: The results reveal several differences between managed and intact forest stands, primarily due to the homogeneity of a certain type of structure at the stand level. In intact stands, when the dimensional diversity of trees is either at its lowest ($G < 0.5$) or highest ($G > 0.7$), only 10 to 15 trees are needed to form a CIP. However, in stands with Gini index values between 0.5 and 0.7, 15 to 18 trees are necessary to adequately capture the dimensional heterogeneity of the trees. In managed stands, despite lower dimensional diversity of trees across the entire IA, there are much larger and more frequent variations between CIPs within the same IA, so more trees are needed to form a CIP until the Gini index stabilizes: at least 17 trees are required in stands with moderate dimensional diversity ($G = 0.30–0.60$), and up to 21 when $G = 0.40–0.45$.

The structure of virgin stands, a model for restoring degrade stands

Ciprian VASILE, Daniel TURCU, Oliver MERCE, Cătălin CIONTU, Nicolae CADAR

National Institute of Research - Development in Forestry "Marin Dracea", Timișoara, Romania.
E-mail: vasile.ciprian99@yahoo.com

The study on the structure of virgin forests, used as a model for the restoration of degraded stands, analyzes virgin forests as essential ecological benchmarks in the context of the current environmental crisis, marked by biodiversity loss and forest habitat degradation. The aim of the research was to identify the structural and functional characteristics of these ecosystems and to explore their applicability in the restoration of forests affected by human exploitation.
The research was carried out in beech forests within the "Izvoarele Nerei" Nature Reserve, where three sample plots (118, 119, and 120) were analyzed during two monitoring stages (2004–2006 and 2016–2017). The methodology included the evaluation of tree distribution by height and diameter classes, as well as an auxological study of growth. The results highlighted a continuous layered structure, active natural regeneration, and the presence of dominant mature trees, demonstrating the self-regulation and ecological balance specific to virgin ecosystems.
Comparative analyses revealed a trend of ecological maturation, confirmed by stable logarithmic distributions and by slow but steady increases in both height and diameter. These findings support the use of virgin forests as functional models for the ecological reconstruction of degraded stands. The central conclusion of the study is that virgin forests can serve as a valuable benchmark for sustainable forest management, not through mechanical imitation, but through the integration of their fundamental principles—dimensional diversity, structural stability, and adaptability to site conditions.
Keywords: virgin forests, biodiversity, plots, regeneration, ecological reconstruction.

Effect of Light Availability and Ecological Gradients on Natural Regeneration within Old-Growth Sessile Oak-Beech Forest

Gruita IENASOIU[1,2], Florin Lucian TOIU[2], Ion Catalin PETRITAN[3], Nicu Constantin TUDOSE[2], Lucica Catalina TOIU[2], Oliver MERCE[2], Daniel-Ond TURCU [2], Mihai FEDORCA[2], Any Mary PETRITAN[2], Cătălin-Constantin ROIBU[1]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania
[2]National Institute of Research - Development in Forestry "Marin Dracea",, Romania;
[3]"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: igruita@gmail.com

Europe's primary and old-growth sessile oak-beech forests are rare and crucial for understanding natural forest dynamics. Natural regeneration in these ecosystems is a complex process governed by the disturbance regime (e.g., wind) that creates canopy gaps. The study aimed to evaluate the influence of light availability (direct and diffuse) and other ecological factors (gap size, ground vegetation competition, browsing pressure) on the density and composition of natural regeneration of sessile oak (*Quercus petraea*) and European beech (*Fagus sylvatica*) in the Runcu-Groși Reserve, Zarand Mountains, Romania.

The research was conducted in 27 canopy gaps (small: < 400 m2, medium: 400-800 m2, large: >800 m2) and in the closed stand. Nine circular plots per gap, positioned along cardinal directions, were used to record regeneration density across height classes, above-ground biomass, and browsing damage. Light availability (TSF, DSF, ISF) was measured using hemispherical photography at 1.3 m height. ANOVA and Generalized Linear Models (GLM) were used for statistical analysis.

The results highlighted the following three aspects:

- Light availability increased with gap size, with TSF ranging from 6.5 % to 32%. Light values proved critical for seedling development, with sessile oak requiring at least 15-20% Direct Site Factor (DSF) for successful regeneration.
- Although the highest total seedling density was recorded in small gaps (2,044 seedlings / m2), this was dominated by small sessile oak seedlings (<20 cm). Conversely, taller saplings (>130 cm) were 7.5 times more frequent in large gaps, where beech was dominant. A species dominance inversion was observed across height gradients: oak dominates the 5-20 cm class but is almost absent in taller classes, where beech takes over, confirming oak's decreasing shade tolerance with increasing age.
- As Biotic Factors Beech regeneration biomass was significantly higher than oak's in large gaps. Oak was the most heavily browsed species by herbivores (up to 16% in large gaps), but the effect was not strong enough to change overall stand composition. Ground vegetation cover (up to 62% is dominated by *Rubus sp*.) was significantly higher in large gaps, indicating strong competition.

In conclusion the natural regeneration of sessile oak-beech stands is critically shaped by light availability and inter-specific competition that shifts with height. Sessile oak shows good initial establishment but fails to persist in taller height classes due to insufficient light requirements in smaller gaps and the superior competition from beech. This dynamic suggests that, without active management (e.g., increasing gap size, controlling ground vegetation and ungulates), beech will become dominant in the next generation, compromising the conservation of the mixed sessile oak-beech stand.

The study was financed by the Romanian National Authority for Research by project PN23090301, within the FORCLIMSOC NUCLEU program.

Adapted forest management for biodiversity conservation in mountain Norway spruce forests under climate change BIOFORMA project presentation

Gruita IENASOIU[1,2], Any Mary PETRITAN[2], Nicu Constantin TUDOSE[2], Raul Gheorghe RADU[2], Mirabela MARIN2, Danut CHIRA[2], Nicolai OLENICI[2], Gabi LAZAR[2], Constantin DUMITRU-DOBRE[2], Cătălin-Constantin ROIBU[1]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania
[2]National Institute of Research - Development in Forestry "Marin Dracea", Romania.
E-mail: igruita@gmail.com

Mountain Norway spruce-dominated forests (MSF) have been recognized as highly sensitive to the changing environmental conditions caused by climate change. However, in the alpine biogeographic region across Europe, these forest ecosystems are of great ecological, economic, and cultural importance. It is therefore crucial to understand future development trajectories of these forests in order to maintain their functionality and resilience.

Our main objectives in this project, are *(1)* to evaluate the consequences of different forest management scenarios in the context of climate change for biodiversity and ecosystem functions of spruce-dominated mountain forests and *(2)* to provide recommendations to stakeholders for adaptive management options in these sensitive forest ecosystems.

To achieve our goals, we will conduct a detailed assessment of forest structures in 500 plots of 100 forest stands, covering the broad spectrum of structural diversity in MSF and reflecting the outcome of the different forest management systems traditionally applied in Switzerland, Croatia, Bulgaria and Romania: from no management to small-scale irregular shelterwood to clearcut harvesting. We then assess the biodiversity of key functional groups of organisms in these plots, covering a wide range of taxonomic groups including soil microorganisms, vascular plants and mosses, fungi, insects, and birds, and link this to forest structural properties.

Using forest growth models, we will assess development trajectories of MSF under different forest management and climate scenarios and identify best practices to maintain the biodiversity and ecosystem functions for more resilient future forests. In addition, we will use remote sensing data (drone- and airborne-based LiDAR, multitemporal satellite data) to upscale biodiversity values to the landscape level.

Ultimately, the results of this project will inform stakeholders and practice on how to adapt future management of MSF across the alpine biogeographic region of Europe, taking into account potential trade-offs between wood production and diversity. Moreover, the project will promote knowledge transfer and capacity building in the participating countries.

This project is carried out and financed within the framework of the second Swiss Contribution MAPS (project code F-RO-CH-2024-0280).

Environmental pressures and threats on protected natural ecosystems (case study: south-east of the Republic of Moldova)

Ala DONICA[1], Viorica ANGHELUȚA[2], Iradion JECHIU[2], Rodica COJOCARI[2]

[1]Laboratory "Natural and Anthropogenic Ecosystems", Institute of Ecology and Geography, State University of Moldova;
[2]Laboratory "Geography", Institute of Ecology and Geography, State University of Moldova.
E-mail: aladonica1980@gmail.com

The paper analyzes the impact of abiotic factors on protected natural ecosystems in the southeast of the Republic of Moldova, a region characterized by a high diversity of natural landscapes/ecosystems, but also by increased vulnerability to environmental changes and anthropogenic pressures. The main pressures and threats, generated by abiotic components (especially the climatic, hydrological, soil and geomorphological regime) can manifests a negative impact on the integrity, conservation and protection status of natural habitats and biodiversity in the region.

The transdisciplinary study, based on the integrated analysis of climatic, geological, geomorphological, hydrological, soil data, the national ecological network and the system of protected areas, complemented by GIS interpretation and field observations, proposed measures for sustainable management of natural heritage.

The predominance of unstable landscapes (about 70% of the researched area) is due to the land use, mainly by agricultural/built geographical landscapes and the morphological specificity of the region (which induced soil degradation, loss of fertility and increased erosion). The settlements and constructions in the region have a more pronounced impact on the natural ecosystems located in the Northeastern part of the researched region, and on the ecosystems located along the local river valleys, through the effects of conversion/degradation of natural ecosystems, generated by the expansion and continuous presence of inhabited areas/activities. The researched area is characterized by a moderate geomorphological vulnerability, determined by the relief particularities and the intensive agricultural use of the lands. Among the predominant geomorphological risks, the erosion of the slopes and soil, the instability of the riverbanks and the clogging of the reservoirs are highlighted.

From the hydro- morphological changes of the Dniester River and its tributaries, the construction of dams and reservoirs on watercourses disrupts the longitudinal connection of rivers, and protective dikes and irrigation canals - influence the transverse connection between the river and the meadow.

The obtained results highlighted the increase in average annual temperatures and the frequency of extreme phenomena (droughts, torrential rains, dry days, etc.). About 20% of the researched territory falls into the area with very high vulnerability to climate aridification, where the long-term presence of moisture deficit causes destruction of forest ecosystems (unfortunately, this area includes most of the protected natural areas in the region, such as the Forest Natural

Reserves - Copanca, Leuntea, Olănești, the “Lower Nistru” National Park and others). The changes in the average values of temperature and precipitation in the territory (South-East of the country), for the periods 2041-2060 and 2081-2100, compared to the reference period (1986-2005), carried out through our own modeling, for the three climate scenarios (RCP 2.6, RCP 4.5 and RCP 8.5), forecast clear changes, both annually and for the warm season (April-October), with a particular emphasis on the summer period (June-August), known for high air temperatures and low precipitation.

At the protected area level, threats have to be identified, monitored and managed to ensure the long-term sustainability of habitats and species. It is recommended to implement adaptive ecosystem management measures, based on continuous monitoring of all environmental components and the application of integrated conservation policies, which ensure the maintenance of the ecological functionality of the protected area network.

Note: The study was conducted within the research project 010801 "Increasing ecological security and resilience of geo-ecosystems to current environmental changes", funded by the National Agency for Research and Development, Republic of Moldova.

Regional/local climate predictions for assessing the vulnerability of natural ecosystems to environmental changes (case study).

Rodica COJOCARI, Ala DONICA

Institute of Ecology and Geography, Moldova State University, Republic of Moldova.
E-mail: rodica.cojocari78@gmail.com

According to the climatic regionalization, the territory of the Republic of Moldova is included in the temperate continental climate zone, and the opening of the country's territory to the Black Sea are the main characteristics that induce noticeable local changes in the dynamics of the atmosphere, with influences on the thermal regime and atmospheric precipitation.
The vulnerability of natural ecosystems, including forest ecosystems, to climate change – a topic increasingly addressed in national studies – indicates that the south of the Republic of Moldova, the region with the lowest forest cover in the country, is the territory most exposed to climate risks. At the same time, the natural ecosystems in the southern part of the country are distinguished by rich and specific biological diversity, protected by various categories of natural areas, which serve as core areas of the National and pan-European Ecological Network (Emerald Network). The creation of the "Lower Nistru" National Park (in 2022, on an area of 62 thousand ha) comes to emphasize the ecological, aesthetic and cultural-historical importance of the natural complexes in this region. Therefore, the study focused on identifying climate change trends and the possible impact on the natural ecosystems in the Southeastern part of the country. Territory under researches includes both banks of the Nistru River; on the right bank are included the Căușeni and Ștefan Vodă administrative districts and on the left bank the area is delimited by the Slobozia district and the administrative border between the Republic of Moldova and Ukraine).
Thus, it was identified that the multiannual average temperature values (1991-2020) recorded in the South-East of the Republic of Moldova (10.0–11.9°C) exceed, in quantitative terms, the multiannual average of the country (10.8°C) by +0.4°C. In temporal terms, the coldest month of the year - January, for the researched area, records average temperatures of -1.8°C, i.e. 0.3°C higher than the average for the republic (-2.3°C). For the warmest month of the year - July, there is also a difference between the average temperature values of this month, for the republic (21.8°C) and the average values in the South-East of the country (23.1°C), which represents a heat surplus of +0.7°C.
The annual absolute maximum air temperature (1991-2020) indicates for the Southeast of the country has values of 36 °C (compared to the average of this climate parameter in the country - of 35.1 °C). Viewed in a temporary aspect, the data recorded at the Ștefan Vodă meteorological station indicate high values (within the limits of 31.7 °C, year 2004; 41.1 °C absolute max., recorded in 2007), with a linear upward trend (+1.8 °C degrees/decade).
The annual absolute minimum air temperature (1991-2020) indicates for the Southeast of the country absolute values of -18.2 °C (compared to the average of this climate parameter in the

country - of -18.5 °C). The data of the Ștefan Vodă meteorological station indicate minimum values of -25.3°C (year 2006); and -8.3°C (year 2020), and a linear upward trend, even barely perceptible (+0.6 degrees/decade), which is part of the general trend of climate change in the region.

For the studied region, the average annual rainfall is 510 mm, which is 30 mm less than the national average.

The degree of aridity of the territory, expressed by the De Martonne index (MI), indicates that the researched area is predominantly classified in a semi-humid and humid climate (about 60% of the territory), with values of MI>24.0 units, followed by a Mediterranean climate (MI between 21-24 units), i.e. about 40% of the researched territory. According to MI values, territory climate is favorable for the certain plant communities' development, namely: (a) values of MI between 20-25 units indicate a climate favorable to the development of the steppe with tall grasses and (b) values of MI between 25-30 units - a climate favorable to the development of the forest-steppe. Therefore, the more important from the ecological stability point of view are the protected forest ecosystems in the region.

The multiannual (1980-2020) values of MI framed the forest ecosystems into two zones: (a) the area with very high vulnerability (MI values below 25 units), comprising about 20% of the researched territory, and (b) the area with high vulnerability (MI values vary between 25-30 units) - comprises 80% of the researched territory. Unfortunately, the area with very high vulnerability includes most of the protected forest ecosystems in the region (Forest Natural Reserves - Copanca, Leuntea, Olănești, the eastern part of the "Lower Nistru" National Park and others).

Climate evolution simulations, based on greenhouse gas emission scenarios, allowed estimating future changes in temperature and precipitation in the South-East of the country, for the periods 2041–2060 and 2081–2100, compared to the reference period 1986–2005. These projections, obtained through our own modeling for the three climate scenarios RCP 2.6, RCP 4.5 and RCP 8.5, indicate obvious changes in the value of the average annual temperature and the average annual amount of precipitation, but also in the values of these climate parameters for the tree vegetation season (April–October).

The data obtained clearly outline trends in climate change at the regional/local level, which requires the identification of appropriate/sustainable measures for the conservation of the natural heritage in the researched area.

Note: The study was conducted within the research project 010801 "Increasing ecological security and resilience of geo-ecosystems to current environmental changes", funded by the National Agency for Research and Development, Republic of Moldova.

Coping Mechanisms of Rural Households to Shocks: The Role of Socio-Economic Determinants and Strategies in Kakamega Forest, Kenya

Ibrahim OSEWE, Nicolae TALPA, Bogdan POPA

"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: osewe.ibrahim@unitbv.ro

Rural forest communities in developing countries face multiple and compounding shocks that increase their vulnerability and reliance on limited coping options. While many studies have examined how socio-economic factors shape coping strategies, few have explored the combined and interacting effects of these factors on strategy selection across diverse shock types. This study investigates the types of shocks experienced by communities surrounding the Kakamega Forest Ecosystem (KFE) in western Kenya, the coping strategies employed, and how socio-economic characteristics and their interactions influence these responses. Using participatory approaches, primary data were collected through 8 focus group discussions, 17 key informant interviews, and 453 structured household survey. Data were analysed using Chi-square tests, ANOVA, Poisson, and negative binomial regression models. Economic distress and illness emerged as the most widely acknowledged shocks. Significant differences were found across wealth categories and Community Forest Association (CFA) membership for illness, unemployment, animal disease outbreaks, and economic shocks. Only animal disease shocks varied significantly by gender of household head. Forest harvesting was the most frequently adopted coping strategy, used in response to 78% of shocks, underscoring the forest's buffering role. Consumption reduction was common among poor households during unemployment and economic distress, while productive asset sales were triggered by economic and health-related shocks. Rich CFA members and male headed households were less likely to adopt costly or asset-depleting strategies. The paper demonstrates that forest resources serve primarily as short-term safety nets, underscoring the importance of reducing socio-economic disparities and enhancing forest governance to avoid poverty traps and foster resilient, context-specific policies.

Keywords: Forest-dependent communities, Coping strategies, Socio-economic vulnerability, Multiple shocks, Kakamega Forest Ecosystem

Needs, challenges and barriers faced by girls and young women in Romania for choosing a career in forestry

Cătălina BARBU, Ramona SCRIBAN

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: catalina.barbu@usm.ro

Forestry and related industries are facing labour shortages and a decline in the number of women choosing careers in forestry. To address these challenges, innovative career pathways for girls and young women, strengthening the capacity of forestry education institutions through gender mainstreaming, and facilitating framework conditions for effective involvement of women are essentials. In Romania, there are few high schools with a forestry profile, but some have diversified their profiles due to new job market demands. This study aims to identify barriers and needs for better inclusion of girls and young women in the forestry sector. Two sets of questionnaires were designed to collect quantitative data from both forestry and non-forestry students in order to identify the needs, challenges and barriers for inclusion. The results showed that 78% of non-forestry respondents are not aware of career opportunities in the forestry sector and did not see forestry as a viable career option due to a lack of passion for the field or simply not interesting. The fact that they did not consider getting a forestry degree is also due to the lack of awareness campaigns conducted by forestry faculties However they also need more access to educational materials, more forestry-related workshops or field trips, more female role models, and guidance from career counsellors. On the other hand, the main areas of interest for forestry students include conservation/environmental protection, forest management, and ecology. Efforts to attract young women into forestry should focus on changing the image of the sector by addressing gender issues and emphasizing the importance of women in forestry for sustainable development and forest management.

Who cares for nature? Linking socio-demographic characteristics and environmental perceptions along Via Transilvanica

Medeea HALICI[1,2], Laura BOURIAUD[1]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania;
[2]Botoșani County Museum, Natural Sciences Section, 1 Decembrie, 715200 Dorohoi.
E-mail: medeea.halici@yahoo.com

Nature represents an essential element for maintaining ecological balance, providing the resources necessary for life and ensuring spaces for recreation. The perception of the natural environment is shaped by a complex set of individual, cultural and social factors. The present research aims to highlight the main determinants that mediate the relationship between humans and nature. At the national level, this interaction is illustrated by the thematic route Via Transilvanica, the first project of its kind in Romania, which integrates tourism, education and biodiversity conservation into a unified initiative aimed at reconnecting people with the natural environment.

Within this research, environmental values, perceptions and attitudes were assessed through the administration of a questionnaire that included the New Ecological Paradigm (NEP) scale, adapted to the Romanian context and to the specific characteristics of the Via Transilvanica trail. A total of 202 valid questionnaires were collected in the period 2023–2025, with the methodology grounded in solid references from the specialized literature. The study applies the NEP scale to identify and analyze perceptions and attitudes toward the environment among consumers of ecosystem services associated with the trail. Furthermore, the study analyzed how experiences with nature and the socio-cultural context can influence the formation and consolidation of environmental awareness.

The results highlight the validity of the NEP scale as a tool for analyzing ecological attitudes and the level of openness toward environmental changes. Four attitudinal dimensions were identified (ecocentrism, resiliocentrism, anthropocentrism and technocentrism), revealing a predominant ecocentric orientation among participants. At the same time, the findings emphasize the importance of correlating these results with demographic variables to obtain a comprehensive and rigorous perspective on the factors shaping environmental perceptions and behaviors.

Keywords: environmental sustainability, ecological behavior, human–nature relationship, environmental perceptions.

Integrating tourist perceptions into sustainable forest management: evidence from the Via Transilvanica trail

Cerasela TEODORESCU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: acatincai.cerasela21@gmail.com

Forests play an essential role in supporting nature-based tourism, pro-viding valuable ecosystem services and recreational spaces for tourists. The present study explores tourists' perceptions of forest management along Via Transilvanica route in order to assess their acceptability and to identify obstacles and difficulties associated with contribution of forests to sustainable nature-based tourism. The data collection is based on a questionnaire applied to a diversified sample of visitors. The results reveal significant support for measures such as a ban on clear felling and the establishment of buffer zones without forestry activities along the touristic path. There was also a high acceptance rate for the implementation of informational measures, such as the installation of information boards about forestry activities being carried out in the area of the trail. The study shows existing correlations between tourists' perceptions and socio-demographic factors, highlighting differences according to age, level of studies and living environment (rural or urban). The findings suggest that a balanced combination of direct (regulations and restrictions) and indirect (education and communication) management measures can facilitate forest conservation and increase the attractiveness of forests for tourism along Via Transilvanica trail.

Policy frames and legislative pathways for rewilding: A comparative analysis across eight European countries

Ionut Casian BALABAȘCIUC, Laura BOURIAUD, Liviu NICHIFOREL

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: ionutbalabasciuc@gmail.com

The rewilding concept has gained traction in European ecological discourse but remains ambiguously integrated into national legislation. This study systematically compares legal and programmatic documents from eight countries, applying a content analysis framework to identify explicit and implicit references to rewilding. The analysis reveals that while European directives (Habitats and Birds) provide a supportive backdrop, national policies often rely on indirect measures, creating inconsistencies in governance. Trade-offs were particularly evident in the fields of land use change, financial instruments, and protected areas, reflecting tensions between ecological restoration, agricultural transitions and economic interests. Programmatic documents emerged as key vehicles for introducing rewilding, preceding its legal codification. We conclude that advancing rewilding in Europe requires both clearer legal definitions and stronger inter-sectoral policy coordination, ensuring that governance frameworks balance ecological ambitions with socio-economic realities.

Economic Sustainability and Circular Economy: high hopes or low expectations?

Marian DRĂGOI, Vasile STRÎMBEANU-IACOBAN, Tudor ARTENIE

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: marian.dragoi@usm.ro

The paper analyzes key issues in the new EU circular economy, particularly the disconnect between Life Cycle Assessment (LCA) and the EU's public agenda, and the problem of greenwashing, using waste management as a case study. This analysis is grounded in data from a new curriculum developed under the SA2CC Erasmus Program (Sustainable Agriculture under Climate Change), which is coordinated by the "Ștefan cel Mare" University of Suceava (USV).

National program for the expansion and rehabilitation of forests in the Republic of Moldova

Oxana RUSNAC

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: oxanarusnac12@gmail.com

Challenges, solutions and achievements within the National Program for the Expansion and Rehabilitation of Forests in the Republic of Moldova.

The Revision of Forest Management Plans: Beyond an Economic Perspective

Vasile STRÎMBEANU-IACOBAN, Marian DRĂGOI

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: vas_strimbeanu@yahoo.fr

The primary objective of the present study is to develop and operationalize a transparent, multi-stakeholder decision-support methodology for assessing the necessity and opportunity of long-term forest management planning decisions. The proposed framework integrates a broad spectrum of stakeholders, encompassing both end-users—specifically, the technical staff of forest districts and forest directorates—and implementing entities, namely forest management enterprises and the National Institute for Research and Development in Forestry "Marin Drăcea".

Analysis of stakeholder perceptions in the development of the Romanian forestry code

Mariana CENUȘĂ

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: marianacenusa27@yahoo.com

Romania's forests represent a subject of great interest for various stakeholder groups. This article analyzes stakeholders' perceptions of the necessary forest policy measures for providing ecosystem services, with a particular emphasis on biodiversity. The research employs the methodology of qualitative analysis of stakeholders' responses regarding biodiversity in the preliminary consultation on the new Forestry Code, thereby identifying the relevant stakeholders, their positions, and proposals. The stakeholders' capacity to formulate clear and feasible legislative proposals is still low. The majority of the submitted proposals were general, and only a few of them had real potential to be transformed into concrete legal norms. The results provide important insights for the future, as the low level of stakeholder involvement highlights the need for developing and implementing more effective communication strategies.

Assessing time-varying trends in the wood market as an indicator for environmental costs and impacts of forest management

Dragoș COSTÎN

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: dragoscostin77@gmail.com

The efficient and ecologically sustainable utilization of the timber obtained through forest harvesting activities represents a key objective for both the public and private economic sectors. The challenge becomes increasingly complex as the factors influencing prices on the primary wood market combine forest production volume and structure with local, regional, and international market realities.

The purpose of this research is to develop an original study on the evolution of timber prices in Suceava County and to assess the potential effects induced by various environmental or anthropogenic disruptive factors. The objective of the phase report titled Market Trends of Timber as an Indicator for Environmental Costs and the Impact of Forest Management was to identify price evolution trends for the period between March 2021 and February 2025.

For this study, a database consisting of 6,828 records regarding the sale of standing timber through timber auction procedures organized by the Suceava Forest Directorate was used. The elements included in the database were: Forest District, harvest year, month, timber lot, production unit, management unit, type of felling that generated the product, harvested area, commercialized volume, starting price, and final awarded price. The evaluation period covered March 2021 to February 2025.

Summary statistics were used to describe the dataset, including mean, standard deviation, quartiles (25th and 75th), minimum, and maximum values. The distribution of individual values for each analyzed category was assessed using specific statistical tests. The ANOVA test was applied to determine differences among categories and years, while the TUKEY test was used to evaluate significant differences between population means. Linear, polynomial, and multiple regression analyses were conducted to assess relationships between the acquisition price variable and various independent variables. Statistical analyses were performed using Python computational routines.

Analysis of existing payment systems in Romania for promoting social forest services

Medeea HALICI, Ionuț BALABAȘCIUC, Cerasela TEODORESCU, Laura BOURIAUD

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: medeea.halici@yahoo.com

In the context of increasingly accelerated global changes, innovative tools have been introduced to protect forest ecosystems and the services they provide, alongside traditional conservation methods. This aspect is proven by the growing interest in implementing payment systems for ecosystem services, or at least monetary quantification of these services.
This study analyzes the evolution of Romania's legal framework on forest compensations, starting with Order No. 625/2006 and culminating in the recent Forestry Code (Law No. 331/2024) and Government Decision No. 167/2024. In addition to the legislative analysis, the research includes a case study along the Via Transilvanica route, where the opportunity cost of restricting silvicultural operations in adjacent forest stands was estimated under several scenarios. The analysis compares management scenarios ranging from full conservation (SUP E) to sustainable use (SUP M) and assesses buffer zones.
The findings emphasize the need for a balance between ecological integrity, social functions, and economic viability, revealing that the compensation schemes currently applied in Romania offer lower payments than the actual opportunity costs estimated through our analysis. Moreover, the limited focus and investment in practical instruments for forest conservation constrain progress toward achieving ecosystem protection objectives. Therefore, future research should focus on developing more effective and transparent mechanisms to ensure both adequate forest protection and fair compensation for landowners.
Keywords: protected areas, forest policy, ecosystem services, economic instruments, compensations.

Empowering communities to fight against desertification. A stakeholder decision

Andrei APĂFĂIAN, Diana VASILE, Mihaela VIERU, Vlad CRIȘAN

National Institute of Research - Development in Forestry "Marin Dracea", Brașov, Romania;
E-mail: apafaian.andrei@gmail.com

It is imperative to address the issue of desertification, defined as the transformation of formerly fertile land into arid and degraded landscapes. This phenomenon is predominantly driven by anthropogenic activities and is being exacerbated by the ongoing impacts of climate change.
The identification and analysis of historical and current patterns of desertification is necessary to locate critical hotspots. The implementation of innovative solutions in these areas necessitates rigorous assessment and showcase, followed by systematic comparison with conventional and traditional/organic practices. The development of policy recommendations must be undertaken to facilitate broader adoption, and insights and experiences must be disseminated to other regions, vulnerable communities, and the general public.
Desertification poses a significant and urgent challenge in Southern, Central, and Eastern Europe as well as North Africa. In such regions, the capacity of local communities to demonstrate resilience in the face of these impacts is of crucial importance. Such initiatives can be regarded as a pioneering approach to community empowerment, with a focus on fostering resilience through sustainable development, inclusive participation, and locally driven solutions.
In order to address the increasingly pressing challenges posed by desertification, it is imperative to adopt an integrated approach that incorporates nature-based solutions, social initiatives, and technological innovations.
Local communities have been shown to have a pivotal role in enhancing resilience against desertification. Stakeholder meetings have been identified as being of great importance in order to rank and select innovations that tackle the specific problems of desertification. Following the conclusion of the voting procedure, local community representatives proceeded to select the following: i) hydrogel based on lignin; ii) biochar derived from charcoal pyrolysis; and iii) sensors for daily soil temperature and moisture.

Can Siberian elm (*Ulmus pumila* L.) and green ash (*Fraxinus pennsylvanica* Marshall) serve as key species in agroforestry systems developed in southern Romania?

Cristian Mihai ENESCU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania.
E-mail: mihai.enescu@agro-bucuresti.ro

Agroforestry systems offer numerous benefits in arid and semi-arid regions, including improved soil quality, microclimate regulation, and enhanced ecosystem resilience. In Romania, despite the recognized potential, agroforestry remains underutilized. This study aimed to assess the early survival of Siberian elm (*Ulmus pumila* L.) and green ash (*Fraxinus pennsylvanica* Marshall) in a newly established agroforestry system at the HortiNova Nursery (Cârcea, Dolj County). A total of 144 Siberian elm and 138 green ash container-grown seedlings were planted in separate plots in November 2023, intercropped with red oak. Seedling survival was evaluated after the first growing season (September 2024). Results showed a survival rate of 81.5% for Siberian elm and 87% for green ash, under conditions of low precipitation (238.8 mm annually, with half falling in the last quarter), wide temperature fluctuations (1.65–39.13 °C), and moderate relative humidity (average 54.5%). Soil analyses revealed slightly acidic pH (5.75–5.83), moderate humus levels (2.76–3.16%), low nitrogen (0.14–0.16%), variable phosphorus (20.8–66 ppm), and adequate potassium (242–246 ppm). Despite environmental constraints, both species showed promising establishment, with green ash demonstrating slightly greater resilience. These findings support the integration of both species in agroforestry systems in southern Romania, while highlighting the importance of soil nutrient management for successful plantation outcomes.

The Revised FSC Risk Assessment for Romania: Navigating Due Diligence and EUDR compliance

Florin HĂLĂLIȘAN[1], Bogdan POPA[1], Liviu NICHIFOREL[2], Ionuț BÂRNOAIEA[2], Nicolae TALPĂ[1], Ioan Vasile ABRUDAN[1]

[1]Transilvania University of Brasov, Romania;
[2]Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: popa.bogdan@unitbv.ro

FSC risk assessment is a process used to evaluate and address potential risks associated with the sourcing of wood and other forest products. The risk assessment is a document containing 64 indicators covering several key requirements for FSC, such as high conservation values, human and labor rights, environmental protection, etc. In 2024, FSC initiates procedures to review the 2016-2017 Risk Assessments for Romania according to FSC-PRO-60-002 for alignment with EUDR.

The revised FSC Risk Assessment for Romania (FSC-RA-ROU-02-2025), effective August 28, 2025, represents a significant update to the country's forestry sector's framework for responsible sourcing. This revision, conducted by Transilvania University of Brașov under the new FSC-PRO-60-006b procedure aligns with the latest international requirements, including the European Union Deforestation Regulation (EUDR). The primary result of the revision is the completion and publication of the new risk assessment, which provides a detailed analysis of risks for all forest-derived products in Romania. This new document, FSC-RA-ROU-02-2025, is a product of a 12-month development process and is now a critical tool for companies and auditors. It facilitates compliance with both FSC standards and international regulations like the EUDR, ultimately supporting the long-term goal of promoting environmentally appropriate, socially beneficial, and economically viable forest management in Romania.

Along the process 21 non-negligible risks were identified. Even though there are laws and control procedures on place for reducing corruption, there are still significant cases of such activities in the forest sector, as perceived also by the international organisations. Despite the fact that the quality of harvesting has increased in the last years, there are still discrepancies between the requirements and the situation in the field, leading to a non-negligible risk conclusion. The use of outdated machinery and logging practices continue to pose a significant risk for pollution. While the functional zoning system protects important water resources, the practices implemented in the forest harvesting represent a risk for watercourses that supply small farms or households close to the forest. Despite the presence of a robust normative framework that should safeguard workers, health and safety requirements in harvesting activities are often not complied with and the occupational fatalities in forest harvesting remain high. Therefore, the new assessment framework has a substantial impact on forestry practitioners and companies in Romania.

Assessing and Mitigating Systemic Risks: PPE Deficits and Fatal Accidents in Romanian Forestry Sector

Alexandra POPA

FSC (Forest Stewardship Council), Romania.
E-mail: a.popa@fsc.org

The forestry sector exhibits a high risk profile, ranking among the most dangerous occupations both at national and international level. Work in this sector records significantly higher accident rates compared to other industrial sectors. Romania ranks among the top five European countries for fatal accidents in agriculture, forestry and fishing. Data confirms that in 2024, the frequency index for fatal accidents in Silviculture and Forest Exploitation (0.53 per 1000 employees) was substantially higher than the national average (0.02).
This research assesses the deficiencies that contribute to these high accident rates and evaluates different mitigation strategies.
An analysis of audit reports, legal frameworks, surveys, and interviews reveals that there is a significant gap between legal requirements for occupational safety and the reality in the field.
The research findings serve as a radiography of the status of Romanian forestry sector and confirms that the sector continues to rely on less mechanized technology and poor investment. This economic fragility also impacts the safety provision, particularly regarding Personal Protective Equipment. Discomfort, as the dominant barrier often mentioned by the respondents, show that the equipment provided often represents the cheapest option available, showing a lack of investment attributed to the highly regulated, competitive business environment that restricts the opportunity for large-scale procurement and limits the necessary contractual predictability required for companies to afford substantial investments.
The core goal of voluntary FSC certification efforts, which are often viewed as a Corporate Social Responsibility (CSR) tool, is to foster responsible management by requiring compliance with sustainable forest management standards, including specific H&S requirements.
To shift the figures, investment must be directed toward two core prevention actions, raise awareness and education, which FSC Romania will support through an action plan.

Sustainability advisory services - Getting ready for the EU Deforestation Regulation

Ramona Elena SCRIBAN

Preferred by Nature, Romania.
E-mail: rsc@pbn.org

The European Union Deforestation Regulation (EUDR) presents a significant shift in regulatory expectations for companies sourcing key commodities. For corporate sustainability leads, this regulation demands not only legal compliance but a strategic transformation of supply chain practices to ensure deforestation-free, legally produced, and traceable products. This presentation by Preferred by Nature—a global non-profit with over 30 years of experience in sustainability advisory—offers a practical, phased approach to help corporations meet EUDR obligations by December 2025. It emphasizes the development and implementation of robust Due Diligence Systems (DDS), tailored to corporate structures and operational realities. Phase I focuses on readiness through gap analysis, traceability assessments, and strategic planning. Phase II supports implementation with policy alignment, supply chain mapping, risk assessment, and stakeholder engagement. Continuous improvement is enabled through performance evaluations and ongoing advisory support. Corporate sustainability leads will gain insights into the essential components of a DDS, including documented procedures, qualified teams, supplier engagement, and traceable supply chains. The session introduces Preferred by Nature's EUDR-aligned Sustainability Framework and Certification Standard, which includes 39 indicators covering legality, environmental protection, human rights, and climate impact.
The presentation highlights how advisory services—such as independent verification, bespoke training, IT system integration, and supply chain risk analysis—can be leveraged to embed sustainability into procurement and compliance strategies. It also addresses how to align internal policies with external expectations, manage supplier relationships, and prepare for verification and reporting. This presentation outlines how sustainability advisory services can equip corporate leaders with practical strategies to achieve EUDR compliance, minimize supply chain risks, and embed responsible sourcing and environmental stewardship into long-term business value creation.

Digitalization, interoperability, and innovation for compliance, transparency, and support smart business organization

Bogdan BULIGA

Sustainability Today, Romania.
E-mail: bogdan@buliga.info

Digitalization, interoperability, and innovation are the promoters of for compliance, transparency, and support smart business organization. Legal requirements, such us EU Deforestation Regulation (EUDR) raise the bar for organization and transfer part of the voluntary initiatives into regulatory. Romania possesses one of the most advanced informatic systems from forestry sector (SUMAL), although it is vitally essential to step up data interoperability and make use of big data analytics for smarter decisions. With our activities at Sustainability Today, we develop novel digital solutions that render raw compliance data usable as actionable intelligence. One example is our solution that allows firms to directly enter their harvesting license code (APV) and automatically receive a corresponding GeoJSON file making traceability and verification process possible. Another example that can also apply to universities and other academic institutions is our platform Agora Today—the digital public consultation system designed to put together various consultations in transparent and intuitive form. These two solutions demonstrate how digitalization, interoperability, and data-driven evaluation can enable both regulatory compliance and broader research and societal activities.

Preferred by Nature Certification – A tool for EUDR aligned Forest Management

Tudor ȘERBAN

Preferred by Nature, Romania.
E-mail: tserban@preferredbynature.org

This presentation introduces the Preferred by Nature Certification as a comprehensive solution for addressing the challenges posed by the European Union Deforestation Regulation (EUDR). It outlines how the certification framework aligns with EUDR requirements, offering a robust and adaptable system for forest operators navigating legality, sustainability, and traceability obligations. The presentation begins with an overview of Preferred by Nature's mission-driven approach to sustainable land use and supply chain assurance, highlighting its global reach and experience across forestry and agricultural sectors. It then delves into the structure of the certification standard, which is built on 4 principles, 25 criteria, and 159 indicators, covering critical areas such as human rights, environmental protection, climate impact mitigation, and responsible business practices. Special emphasis is placed on the EUDR-aligned indicators embedded within the certification, including 46 core indicators and 17 add-ons tailored for FSC Forest Management certified operations. These indicators support compliance with EUDR's due diligence requirements, including geolocation data management, risk assessment, and sustainability verification. The presentation also explores the flexibility of the certification system, which can be adapted to different commodities, scales of operation, and verification needs, whether through stand-alone audits or integrated assessments. Tools such as the Sourcing Hub, Due Diligence Toolkit, and Carbon Footprint Management add-ons are showcased as practical resources for operators and companies seeking to meet EUDR obligations while advancing broader sustainability goals. In conclusion, the presentation positions the Preferred by Nature Certification as a credible and harmonized framework that not only facilitates EUDR compliance but also promotes long-term environmental stewardship and social responsibility across global supply chains.

Innovation in tree marking - the institutional conditions of technological development

Dorin Florențiu PĂLIE, Mihai GĂȘPĂREL, Laura BOURIAUD

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: dorinpalie84@gmail.com

Ensuring wood traceability constitutes a central element of modern forest governance, being essential both for the responsible functioning of the market and for compliance with national and European legal requirements. Within Regulation (EU) No. 995/2010 (EUTR), the concept of "due diligence" represents a key instrument for verifying the legal origin of timber and for preventing trade in forest products from illegal sources.

In Romania, the experience of the last decade in developing a wood traceability system highlights the authorities' constant concern for modernizing the sector.

National forestry legislation, grounded in the principles of sustainable forest management, is increasingly challenged to respond to the advances of new technologies – from the digitalization of origin documents to the use of sensors, satellite imagery, and Lidar. In this regard, the process of drafting normative acts must adopt a participatory approach, based on consultation with all interested stakeholders: economic operators, public institutions, non-governmental organizations, and local communities – in order to ensure the efficiency and acceptability of regulations.

This analysis pursues two major directions: *i)* to what extent the legislative process can integrate emerging technologies to improve wood traceability; *ii)* identifying how these technologies generate transformations not only in legislation but also in the business model of the forestry sector.

Nevertheless, although the initial purpose of the forestry information system was the full integration of recordkeeping and reporting processes, its practical implementation has favored the traceability component. This evolution indicates a predominantly technological orientation, yet less of a strategic integration between digitalization, forest planning, and participatory governance. The lack of a coherent framework for interconnection between databases, institutions, and economic actors limits the system's efficiency and its potential to generate real transparency.

From this perspective, the study contributes to understanding the relationship between technological innovation, regulation, and forest governance. The development of the reporting component would be beneficial not only to economic operators but also to the debureaucratization of the forestry sector. Wood traceability can evolve from a simple control instrument into an integrated mechanism of sustainability, legality, and transparency—capable of strengthening public trust and supporting the transition toward a digital and responsible forest economy.

Comparative analysis of selling timber methods across ten European Countries

Liviu NICHIFOREL[1], Bogdan POPA[2], Florin HĂLĂLIȘAN[2], Nicolae TALPĂ[2]

[1]Forestry Faculty, Stefan cel Mare University of Suceava, Romania;
[2]*Transilvania University of Brasov, Romania.*
E-mail: liviu.nichiforel@usm.ro

The presentation provides a comparative analysis of the organization and functioning of ten European entities responsible for managing state forests: from Austria, the Czech Republic, Croatia, Estonia, France, Germany (Bavaria), Ireland, Poland, Slovakia, and Slovenia. Data were collected through three complementary channels: direct interviews with experts from three organizations, questionnaires sent to national experts and documentation from public sources and official reports.
In all analyzed countries, timber harvesting and sales follow the principles of sustainability (resulting from the application of forest management plans), with a clear trend towards selling processed timber and reducing "standing" sales. However, in most analyzed countries, the decision on the form of timber selling is the result of the state organizations' internal strategies, based, in most situations, on a tripartite dialogue between the administrator, harvesting companies, and the industrial processing sector. Standing timber sales are practiced only in the Czech Republic: according to the 2023 annual report, 55% of the timber was sold standing, of which 48% was through long-term contracts (5 years), and 7% of the timber placed on the market (544,000 m3) was through local standing timber auctions intended for small economic agents. In Bavaria, Croatia, France, Poland, Slovenia, and Slovakia, the commercialized timber is sold processed (assorted) from the roadside or from warehouses (predominantly from the roadside). The sale of processed timber is carried out in all cases through national-level regulations, as well as through internal regulations under conditions of transparent bidding/negotiation.
Auctions, however, are the predominant regulated sales method in all countries analyzed. The use of long-term contracts, mentioned in many countries (Austria, Czech Republic, France, Germany, Ireland, Slovakia, Slovenia), is a strategic business decision to ensure stability, not a specific legal imposition regarding how the wood is sold, but rather to whom and for how long.
Most organizations outsource harvesting to specialized contractors and use long-term contracts for stability. With the exception of Croatia, where in-house harvesting teams ensure 35% of the annual quota, in the other countries, the share of in-house teams is used for relatively small quantities. The Czech Republic and Estonia do not manage their own warehouses infrastructure, while in the other countries their share varies widely; in some cases (Bavaria, Slovenia, Estonia) transport to the buyer's gate is provided, as a sales method for processed timber. These practices are oriented towards financial stability, efficiency, and transparency.
The experience of the entities analyzed indicates potential directions for RNP Romsilva, such as strengthening internal operational mechanisms, digitizing information flows, increasing the share of outsourcing, and diversifying funding sources.

Verifying Forest Impacts for Integrated Environmental Resource Management

Alexandra POPA

FSC (Forest Stewardship Council), Romania.
E-mail: a.popa@fsc.org

This presentation introduces the recently revised FSC Ecosystem Services Procedure (FSC-PRO-30-006 V2-0) and its accompanying guidance (FSC-GUI-30-006a), which together establish a comprehensive, voluntary framework for demonstrating the positive impact of responsible forest stewardship on environmental resources. This activity is central to FSC's 2050 vision of "resilient forests sustain life on Earth" and supports corporate efforts to address the climate and biodiversity crises.

The procedure enables forest managers (The Organization) to generate verified or validated Ecosystem Services (ES) impacts across seven critical categories of forest resources: biodiversity conservation, carbon sequestration and storage, water services, soil conservation, recreational services, cultural practices and values, and air quality.

The framework requires a rigorous seven-step process for impact demonstration, starting with the development of a Theory of Change that links specific management activities to measurable outcomes. Managers must select appropriate outcome indicators and apply suitable methodologies (including those specifically detailed in the guidance for each ES category) to measure the current status (present value) against a historical or reference value (baseline). The procedure also integrates key project safeguards, such as addressing additionality and establishing a Revenue Sharing Agreement to ensure the fair distribution of benefits derived from sponsorships. We will have the chance to explore a successful pilot applied in state forest, Maramureș Forestry District and some initial reactions from Forest Administrators in municipal forests.

How occupational health and safety is approached in the forestry sector: Aspects and risk factors in work activities

Ruxandra Georgiana POSTOLACHE

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: ruxandrapostolache@yahoo.com

Occupational health and safety (OHS) is a fundamental field aimed at protecting the life and integrity of workers, with the primary goal of preventing workplace accidents and occupational diseases. In the forestry sector, the risks are significantly higher compared to other industries due to the use of heavy machinery, challenging terrain conditions, and unpredictable environmental factors. The main hazards include tree falls, landslides, vibrations, noise, and exposure to dust and toxic substances, all of which can lead to severe accidents or permanent disability.
Keywords: Occupational health and safety in forestry, Risks, Factors, Forest operations.

Propagation of uncertainty from input data into EFISCEN-Space projections: A case study of Romanian forests

Ioan DUTCA, Raul RADU

"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: idutca@unitbv.ro

Forest resource projection models, such as EFISCEN-Space, are often used to investigate the future development of forests over large forest areas. They typically use the National Forest Inventory (NFI) data to initialize the model, and future projections are produced over a period of several decades. However, the uncertainty of these projections is expected to originate, among other sources related to the model, in the uncertainty of the input data to initialize the model. Here we performed an uncertainty analysis for EFISCEN-Space model using Romanian NFI as a case study. Three types of uncertainty were considered: *(i)* plot sampling uncertainty, *(ii)* tree measurement uncertainty and *(iii)* allometric volume model prediction uncertainty. These uncertainty types were integrated within the following EFISCEN-Space input files: *(i)* plotNrPerHa.csv, *(ii)* plotAttributes.csv, *(iii)* volumeParameters.csv and *(iv)* mortalities.csv. We used a Monte Carlo error propagation procedure in 42 steps, constructed in R, to integrate the three types of uncertainty into the four input files. To propagate the errors from these input files into the EFISCEN-Space projections we performed 1000 replications. For each replication, new input files were produced based on resampled plot data while including measurement uncertainty and volume model prediction residual uncertainty, launched the EFISCEN-Space model for a period of 40 years and retained the aggregated results at the country level. The uncertainty of projections was assessed by calculating the standard error (SE) and coefficient of variation (CV) of projected values for each simulation year. Overall, the uncertainty in the resulting projections was relatively low, due to the large number of plots used to initialize the model. However, the greatest initial uncertainty was observed for the annual harvest, with CV reaching 2.35%. During the simulation period, the greatest relative increase in uncertainty, measured by CV change, occurred for basal area per hectare and tree number per hectare, which saw increases of +90% and +89.6%, respectively. In terms of SE increase, the largest change was observed for mean volume per hectare, which increased by +137.2%. Interestingly, the mean annual harvest was the only variable that experienced a reduction in uncertainty during the simulation period, with uncertainties decreasing by -31.8%. Analysing these changes over time highlights the cumulative impact of uncertainty on forest projection reliability, guiding future improvements in data collection and model accuracy.

Using terestrial land surveying and aerial laser scanning to assess the eficiency of ecological reconstruction - Balaceana ravine

Ionut BARNOAIEA, Gabriel DUDUMAN, Cosmin COŞOFREŢ, Ovidiu IACOBESCU, Ioan CIORNEI

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: ionbarn@gmail.con

Ecological reconstruction of severe, in-depth, soil erosion requires rigorous topographic surveying, to design both hydrotechnical interventions (dams, retention walls, channels) and vegetation planting for slope stability. Given the complexity of such projects, the efficiency of the design and implementation is difficult to monitor in the following years, mainly due to the steep slopes and vegetation density. Terrestrial monitoring procedures could fail to record, in due time, any issues related to the ecological restoration measures. New technologies, based on laser scanning, could be significantly more efficient in the monitoring of ecological restoration projects. In the case of Balaceana ravine (Suceava County), the monitoring of ecological restoration measures taken on 38 hectares ravine was done through a combination of detailed land surveying (2008), sample plot inventory of trees (2017) and aerial laser scanning using Zenmuse L1. The purpose of the LIDAR survey was to verify the accuracy of the method for terrain modelling and for the vegetation monitoring, in areas were ecological reconstruction was performed. The aerial scanning data (point cloud and RGB images) processing was done using DJI Terra software and QGIS, integrating differential correction (post processing) from the ROMPOS network. The classification of points based on the RGB data allowed for the construction of Digital Elevation Model (DEM – ground level), Digital Surface Model (DSM – first reflection) and canopy height model. Previous ground data showed a satisfying accuracy and representativity of the results, which could be integrated in the long-term monitoring of similar land degradation sites.

The climate change and the evolution of Lymantria monacha population in Romania

Dragoș TOMA[1], Gabriela ISAIA[1], Constantin NEȚOIU[2]

[1]"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania;
[2]National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania.
E-mail: gabriela.isaia@unitbv.ro

In recent years, the global climate has begun to change at a rapid pace, with many regions experiencing a warming trend, frequent extreme temperatures, and changes in precipitation patterns. These changes are also reflected in forest ecosystems, where disturbances are increasing in both frequency and intensity.
In Romania it have several gradations, the most important being in the Norway spruce stands of the Eastern Carpathians during 1955-1964, in Broșteni - Borsec districts on an area of 60,420 hectares.
An analysis is needed on the relationship between the population dynamics of *Lymantria monacha* and climate change in recent decades in Romania, in order to understand the evolution of its population over time and to provide information for the control of this major pest of Norway spruce.

The Spruce Bark Beetle Situation in Romania's Forests managed by State Forest Administration: A Look at the Last 10 Years (2015 - 2024)

Mihai-Leonard DUDUMAN[1], Nicolai OLENICI[2], Constantin NEȚOIU[2]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania;
[2]National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania.
E-mail: mduduman@usm.ro

Romanian forests cover approximately 28% (6.93 million hectares) of the national territory, with Norway spruce (*Picea abies*) being the dominant coniferous species, spanning 1.37 million hectares. The Romanian National Forest Administration (RNP) manages about half of this area. The primary threat to spruce stands is bark beetles (*Ips typographus* and *Ips duplicatus*), which proliferate following high winds and/or drought, especially post-2019. Over the last decade, RNP-managed forests recorded 10.56 million m3 of wind-blown trees. Of this volume, 1.345 million m3 (12.7%) was subsequently infested by bark beetles. Additionally, the beetles attacked 2.01 million m3 of standing spruce trees. While no bark beetle "calamity" has been declared, the attacks remain a significant problem, primarily due to poor management coupled with increasingly intense drought periods.

Cormophyte flora of the Făgetul Dragomirna reservation in Suceava county

Cezar Valentin TOMESCU, Cătălina BARBU, Gabriel DUDUMAN

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: cezar.tomescu@usm.ro

Beech (*Fagus sylvatica*) forests in the hilly regions of Moldova constitute important forest ecosystems from a conservation perspective, linking the mountain beech forests of the Eastern Carpathians and the sessile oak forests of the Moldavian Plateau. A representative sample of this type of forest, the Făgetul Dragomirna, consists of a pure beech stand, in which a series of Carpatho-Balkan elements are found that contribute to the specificity of the beech forests in northern Moldova. Despite the numerous studies carried out in this region over time, an inventory of vascular plants within the reserve has not been conducted. Through this work, we aim to fill this gap, as knowledge of the species in a reserve is crucial for all aspects of its proper management. Analyses of bioforms, floristic elements, and ecological indices were also carried out.

Influence of the terrain slope, bedrock lithology and soil depth on the soil erosion processes of tractor roads from the forest area of the Stânișoara Mountains, Suceava County, Romania

Alexei SAVIN, Alexandru-Sebastian ARSINTE

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: alexei.savin@usm.ro

The main goal of the study is to reveal the influence of the main ecological factors such as terrain slope, bedrock type and soil depth responsible for the degradation through erosion of tractor roads in the forest area of the Stânișoara Mountains.
The slope had an effect on the erosion processes, in the sense that there is an almost exponential increase in the cross-sectional area of the road sectors with the increase in the slope of the lands.
Research results revealed that pluvial erosion along forest tractor roads is more pronounced, by more than double the amount of eroded soil, on deep soils formed on relatively soft, easily disintegratable bedrocks such as marls, compared to superficial soils with a lithic character, with an R horizon in the first 50 cm, formed on hard bedrocks such as siliceous sandstones.

Restoration of poorly productive stands

Dionisie COJOCARI

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: vampire77denis@gmail.com

Restoration of 2nd-3rd generation Acacia stands in the Republic of Moldova.

Stellario nemorum-Alnetum glutinosae Lohmeyer 1957 association, *matteuccietosum struthiopteris* (Turcu 1970) sub-association Oroian 1998, in the proximity of the Făgetul Dragomirna reserve

Cezar Valentin TOMESCU, Irina IRIMIA

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: cezar.tomescu@usm.ro

Forests along watercourses, characterized by the presence of black alder (*Alnus glutinosa*), constitute forest ecosystems with high ecological specificity and particular conservation importance. These forests are classified under the priority habitat type of community interest 91E0* - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, according to the Habitats Directive 92/43/EEC and the Interpretation Manual of Natura 2000 Habitats in Romania. These ecosystems stand out due to high biodiversity, important hydrological functions, and high vulnerability to anthropogenic pressures and climate changes. Following the phytocenological analysis of the relevés performed, the studied forest ecosystem was classified in the *Stellario nemorum - Alnetum glutinosae* Lohmeyer 1957 association, *matteuccietosum struthiopteris* (Turcu 1970) Oroian 1998 sub-association. The study also included the analysis of bioforms, floristic elements, and ecological indices. The novelty of this study lies in the identification and description, for the first time in this area, of such an ecosystem in which the species *Matteuccia struthiopteris* is present through a well-represented population, which indicates the existence of an ecological optimum for this species.

Unveiling sustainable operating spaces for European forests - the SOSFOR project

WESTHAUSER A., SPERLICH D., VACCHIANO G., VIZARRI M., OGGIONI S.D., BROCCO S., ALBERICA O.M.M., SANZ A., ESTEBAN E., ZARAUZ I., JIMÉNEZ-CABALLERO P., CURTU A.L., POPA B., POPA A., BESLIU E., HAPA M., EYVINDSON K., NAHORNA O., HANEWINKEL M.

National Institute of Research - Development in Forestry *"Marin Dracea", Voluntari, Romania*;
"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: popa.andrei.dorna@gmail.com

Changing climatic conditions, the associated rise in climate-induced disturbances, and growing societal demands on forests are placing increasing pressure on European forestry. The SOSFOR project aims to demonstrate how European forests can be managed sustainably under these evolving environmental and societal conditions and to provide decision-makers and forest owners with actionable options for the future of Europe's forests.

To support the development and implementation of future policies, five case study areas (CSAs) have been established across Europe. In these CSAs, new data and environmental information on forest sustainability will be generated. Using the "Driver-Pressure-State-Impact-Response" (DPSIR) indicator framework, a harmonized set of indicators will be defined to assess both the status quo of each CSA and their projected development under different local socio-economic pathways (LOSEPs).

These LOSEPs are developed through a participatory process involving close collaboration with local stakeholders, including interviews and workshops, to ensure that regional knowledge and perspectives are fully integrated. These local narratives are then aligned with the global Shared Socioeconomic Pathways (SSPs), forming the foundation for designing alternative forest management strategies tailored to each CSA.

To simulate the future development of forests under these strategies, the process-based and spatially explicit landscape model iLand is applied. This model allows for the assessment of different forest ecosystem services (FES), including timber production, biodiversity conservation, climate regulation, recreation, and water supply. It also enables the mapping of relevant social and economic indicators, contributing to a comprehensive understanding of sustainability outcomes under different climate and socio-economic scenarios. When compared to the baseline (status quo), changes in these indicators, whether positive or negative, reflect the influence of climate and socio-economic drivers on forest-related sustainability. Finally, the modelling outcomes are used to define various response options to inform policy and governance frameworks on how to improve forest-related sustainability in Europe.

Using GIS Techniques to Identify Suitable Land for Afforestation: A Case Study of Cimișlia District, Republic of Moldova

Gheorghe FLORENȚĂ[1], Veronica FLORENȚĂ[2]

[1]Moldova State University, Institute for Forest Research and Design, Republic of Moldova;
[2]Institute of Ecology and Geography, Moldova State University.
E-mail: gheorgheflorenta@gmail.com

The Republic of Moldova, located in a climatically vulnerable region, is increasingly affected by extreme weather events, such as prolonged periods of severe drought, torrential rains, grassland fires, and, notably, soil degradation. In this context, forests and woody vegetation play a crucial role in both climate change adaptation and mitigation. Nevertheless, the country's forest cover remains low (approximately 11%), which limits the ecosystem's capacity to respond effectively to current and future environmental challenges. As a response, the Government of the Republic of Moldova launched the National Program for Forest Expansion and Rehabilitation (PNERP) in 2023, which aims to afforest about 110,000 hectares and rehabilitate 35,000 hectares of forest land by 2032.

This article aims to identify land suitable for afforestation in the Cimișlia district, a representative administrative unit in southern Moldova characterized by high aridity, intense erosion processes, and significant potential for ecological restoration. To achieve this, modern spatial analysis techniques in a GIS environment are employed, combining satellite data, pedological, topographic, and climatic maps with a set of ecological, socio-economic, and legal criteria. The developed methodology involves multi-criteria integration of relevant indicators (slope, aspect, soil type, degree of degradation, proximity to water sources, legal status of land, etc.) and the generation of suitability maps, which allow for the prioritization of analyzed areas according to their afforestation potential.

The study demonstrates the applicability of modern GIS technologies as an indispensable tool for the efficient implementation of environmental policies at both national and local levels. By focusing on the specific case of the Cimișlia district, the paper provides a replicable and adaptable methodological model for other administrative-territorial units in the Republic of Moldova, thus contributing to the achievement of PNERP objectives.

Keywords: forest expansion; GIS analysis; degraded land; climate change; Cimișlia district; Republic of Moldova; PNERP.

Improving UAV Survey Accuracy in Mountain Forests Using Local GNSS RINEX Corrections

Bogdan POPOVICI[1], Raffaele PELOROSSO[2], Mihai AVĂDANEI[3] Cătălin LIXĂNDROIU[4], Cătălin JOIȚA[5]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania
[2]DAFNE Department, Tuscia University, Italy;
[3]University of Petroșani, Romania.
[4]Technical University of Civil Engineering Bucharest, Romania;
[5]GISCAD.
E-mail: axxbogdan@yahoo.com

Accurate UAV surveys in forested mountain terrain remain challenging due to GNSS signal degradation and reliance on distant reference stations. This study demonstrates that using locally collected RINEX data for post-processing significantly enhances both vertical and horizontal accuracy of UAV-based LiDAR and photogrammetric point clouds. Comparative analyses between reference-station and local-base solutions reveal up to a 40% improvement in height precision and stronger spatial consistency across datasets. These results emphasize the crucial role of localized GNSS correction strategies in achieving high-precision UAV mapping under complex canopy and terrain conditions.

MikeShe application in torrential runoff dynamics through the lens of land use change. Case study: Tigai basin - Tarlung reservoir (Brașov - Romania)

Alin Lucian MIHALACHE, Nicu Constantin TUDOSE, Cezar UNGUREAN, Mirabela MARIN, Radu RAUL, Maria Ilinca CHEVERESAN, Mihai STANCU, Nicoleta POPESCU

National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania.
E-mail: mihalache.alin.93@gmail.com

Integrated hydrological modelling is an essential tool for understanding the complex processes that govern surface runoff and watershed responses to extreme events.
This study aims to assess the impact of forest cover changes on runoff dynamics during a torrential event within an experimental catchment in the forested mountain region of Romania. Tigai catchment has 1.38 km2 and is 92% forested.
Hydraulic and hydrological modelling was performed with the MikeShe software.
The MikeShe model was calibrated for an extreme event using a historical series of gauged meteorological and hydrological data recorded into the experimental basin. In doing so, we ensure a high degree of agreement between simulated and observed values.
To capture variations in surface runoff volume, time of concentration, and peak discharge under land use change, we have used three scenarios: 1) maintaining the current land uses, 2) decreasing the forest cover by 25%, and 3) decreasing the forest cover by 50%.
The model outputs highlight the role of forest vegetation in mitigating flash floods and reducing hydrological risk, underscoring the importance of land management measures in preventing hazards associated with extreme rainfall.
The study demonstrates the high potential of the Mike She platform for the integrated analysis of land-use change scenarios and provides a scientific basis for developing strategies for the management and protection of torrential basins.
Keywords: Torrential event, Land use change, MikeShe.
Acknowledgement: This research received funds from the project *"Optimizarea deciziilor de management silvic pentru un viitor cu emisii reduse de carbon și reziliență climatică în Europa"* (contract 35PHE/2024) and partially with the support of the Romanian Ministry of Education and Research, within the FORCLIMSOC Nucleu Programme (Contract no. 12N/2023)/Project PN23090203 with the title "New scientific contributions for the sustainable management of torrent control structures, degraded lands, shelter-belts and other agroforestry systems in the context of climate change".

Digital forestry: technologies, advantages, and perspectives for modern forest management

Iulian-Constantin DĂNILĂ, Ciprian PALAGHIANU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: iuliandanila@usm.ro

Digital forestry revolutionises the way forests are managed and monitored by integrating advanced technologies, including artificial intelligence (AI), the Internet of Things (IoT), big data, cloud computing, and robotics. These innovations enable the collection and analysis of real-time data, improving transparency, efficiency, and decision-making in forest management.
As part of the Fourth Industrial Revolution (Industry 4.0), Forestry 4.0 represents the digital evolution of the forestry sector, where innovative technologies optimise monitoring, resource traceability, and sustainable planning. Tools such as drones, sensors, scanners, GPS, and autonomous robots enhance forest observation, biodiversity conservation, risk management, and the prevention of illegal logging.
Romania's forests, covering about 30.1% of the national territory, provide a strong foundation for integrating digital management solutions tailored to local and European contexts. These approaches are becoming increasingly vital for addressing challenges such as windthrow, wildfires and pest outbreaks, which are amplified by climate change.
This study outlines the technological pillars of forest digitisation, the main benefits for the forestry sector, and the organisational and technical challenges involved. It also highlights the potential of IoT systems for real-time monitoring, biodiversity protection, and community support, aligning digital forestry with sustainable development goals and global innovation trends.
Keywords: Smart technologies, Forest management, Sustainability monitoring, Forest innovations.

Contributions to the forest habitats study of the "Vila Nisporeni" Emerald site

Aliona MIRON[1], Alexandru GALUPA[1], Ala DONICA[2], Serghei TONOFREI[2], Cristina BRAȘOVEANU[2]

[1]Forest Research and Management Institute, Chisinau, Republic of Moldova;
[2]Institute of Ecology and Geography of the State University of Moldova, Chisinau, Republic of Moldova.
E-mail: aliona_miron@yahoo.com

The Emerald Network of the Republic of Moldova, the extension of the pan-European ecological network Natura 2000 to non-EU countries, covers 8.1% of the republic's territory, made of 61 sites, accepted by the Bern Convention (1979) and approved by Law No. 94/2007 at the national level.

The Emerald Site "Vila Nisporeni" (MD00000028) is located in the Nisporeni district, southeast of the Nisporeni city, on an area of 5451 ha. It was established on the basis of the "Vila Nisporeni" Landscape Reserve (3499 ha) for the protection of natural-fundamental stands of sessile oak, pedunculate oak, downy oak and rare plant and animal species. The "Vila Nisporeni" Reserve represents the only place where the forest peony (*Paeonia peregrina* Mill.) grows in the Republic of Moldova, a critically endangered species, included in the Red Book of the Republic of Moldova (2015), located at the northeastern limit of its natural range.

The largest part of the site is covered by natural forests dominated by the main oak species of the Republic of Moldova: pedunculate oak (*Quercus robur*), sessile oak (*Q. petraea*) and downy oak (*Q. pubescens*).

According to the Emerald–Standard Data Form (SDF) for the Emerald site "Vila Nisporeni" the presence of two natural habitats from Resolution No. 4 (1996) of the Bern Convention was indicated: G1.A4 – Ravine and slope woodland and G1.22 - Mixed Quercus-Ulmus-Fraxinus woodland of great rivers.

This study aimed to update the SDF data for this site. Habitat types were analyzed according to geographical characteristics, landforms, soil types, vegetation types, structure and composition of stands. Likewise, the correspondence with forest ecosystem types, forest types, forest station types and formations was analyzed.

Based on the analysis of national data, specialized literature and field research, the "Interpretation manual of the habitats listed in Resolution No. 4" (1996) -Fourth draft version 2019) erroneous identification of previously reported habitats was found. Thus, it is proposed to replace habitat G1.22 with habitat G1.A1 - *Quercus-Fraxinus-Carpinus betulus* woodland on eutrophic and mesotrophic soils and habitat G1.A4 with G1.7 - *Thermophilous deciduous* woodland.

Based on vegetation studies, by analyzing habitat classification systems (EUNIS, NATURA 2000) and habitat interpretation manuals (at European level); comparing with the classification of habitats in Romania (Doniţă N. et al., 2005), a first attempt was made to link and correspond

the vegetation types and the two habitats identified in the "Vila Nisporeni" site with the Natura 2000 habitat types. Thus, the pedunculate oak groves, included in the EUNIS G1.A1 habitat, according to the Natura 2000 classification, correspond to habitat: 91I0 - Euro-Siberian steppic woods with *Quercus spp*., which includes xerothermophilous oak forests from the plains of southeastern Europe.

The pure and mixed sessile oak forests in the EUNIS G1.A1 habitat fall within the Natura 2000 habitat: 9170 - Galio-Carpinetum oak-hornbeam forests, which include *Quercus petraea* and *Carpinus betulus* forests in regions with a subcontinental climate, within the Central European range of *Fagus sylvatica*, dominated by *Quercus petraea*.

The downy oak groves in habitat G1.7 correspond to the Natura 2000 habitat: 91H0 - Pannonian woods with *Quercus pubescens*, which includes the xerophilic oak forests on the edge and hills of the Pannonian Plain, dominated by *Quercus pubescens*, in extremely dry, southern-facing sites, on shallow, calcareous soils.

The data obtained in the study will help identify and describe the measures in the Emerald site Management Plan, which need to be developed according to national acts.

Note: This study presents a combined effort of researchers involved in 2 projects: 1) project 01.08.01. "Increasing ecological security and resilience of geo-ecosystems to current environmental changes", Institute of Ecology and Geography of the State University of Moldova, funded by the National Agency for Research and Development; 2) project LIFE RENATA "Roadmap for aligning the establishment and management of the EMERALD network with NATURA 2000 standards in Moldova", co-funded by the European Union under the aegis of the LIFE program.

The role of botanical studies on land designated for afforestation within the National Forest Expansion and Rehabilitation Program (2023-2032) (on the example of the Cimislia Silvo-Cinegetic Enterprise)

Aliona MIRON [1,2], Alexandru GALUPA [1,2], Marina POPOVA [3]

[1] Forest Research and Management Institute, Chisinau, Republic of Moldova
[2] "Alexandru Ciubotaru" National Botanical Garden (Institute) of the State University of Moldova, Chisinau, Republic of Moldova
[3] Cimislia Silvo-Cinegetic Enterprise, Cimislia, Republic of Moldova
E-mail: aliona_miron@yahoo.com

The National Forest Extension and Rehabilitation Program for the 2023-2032 period (PNERP) aims to increase the forest-covered area and rehabilitate lands with degraded forest vegetation over a total area of 145 thousand ha. The largest area is designated for the creation of new forest cultures - 110 thousand ha, with the rest (35 thousand ha) allocated for the rehabilitation of lands with degraded forest vegetation.

Pastures, especially those affected by various forms of degradation, and lands with landslides and surface erosion are important categories of land eligible under PNERP. Although severely degraded, some of these lands, due to reduced accessibility and abandonment, may still preserve significant floral and phytocenotic diversity. In this context, the botanical study of lands included in PNERP is an important component in the process of developing afforestation projects. Botanical studies are necessary to comply with the provisions of national, international, and European Union policies regarding afforestation and the avoidance of losing lands that host valuable habitats and rare, endemic, relict, or high-conservation-value plant species.

For the expansion of forests in the activity area of the Cimișlia Forestry and Hunting Enterprise, 19 land plots with a total area of 185.8 ha within the mayoralties of Troițcoe, Ecaterinovca, Gradiște, Mihailovca, and Valea Perjei (Cimișlia district) were allocated for the year 2025. Most of the land consists of pastures affected by landslides, with secondary and degraded herbaceous vegetation, invaded by shrubs. Only three plots fall into the category of degraded agricultural land, intended for improvement through afforestation.

As a result of the botanical studies, only 15 of the 19 plots included in PNERP were considered eligible for afforestation. On the other 4 plots, considered botanically ineligible, valuable habitats with steppe vegetation were identified, hosting rare plant species of national and international importance: *Adonis vernalis* (included in Appendix II of the CITES Convention), *Amygdalus nana*, *Asparagus officinalis*, *Astragalus pubiflorus* (critically endangered, endemic, at the southern limit of its distribution range), *Belevallia sarmatica* (vulnerable, relict, endemic to the Eurasian steppe), *Crambe tataria* (endangered, included in the Bern Convention and the Habitats Directive), *Iris variegata*, *Ornithogalum oreoides* (endangered), *Pulsatilla montana*, *Stipa lessingiana*, *S. pulcherrima* (included in Annex I of the Habitats Directive). These species are protected by Law No. 1538/1998, having the status of natural monuments. The species *Astragalus pubiflorus*, *Belevallia sarmatica*, *Crambe tataria*, *Ornithogalum oreoides* are included in the Red Book of the Republic of Moldova (3rd edition, 2015). The most valuable sector with steppe vegetation, identified in the Gradiște mayoralty, is recommended for state protection and subsequent designation as a Natura 2000 site for the protection of species and habitats of European interest.

Phenotypic variation in native and introduced *Quercus* species: insights from a common garden experiment at Hemeius Arboretum

Ioana Maria PLEȘCA[1], Ecaterina Nicoleta APOSTOL[1], Bogdan Ionut PLESCA[1,2], Robert Cristian IVAN[1,2], Cosmin Constantin LOGHIN[1,2], Aliona MIRON[3,4], Ion ROȘCA[4], Ovidiu BADEA[1,2]

[1]National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania;
[2]"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania;
[3]Forestry Research and Management Instiute, Chisinau, Republic of Moldova;
[4]"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova.
E-mail: ioana.plesca@icas.ro

To evaluate interspecific genetic variability and adaptive potential among native and introduced *Quercus species*, a common garden experiment was established at the Hemeius Arboretum, Romania. The study included seven species: native (*Q. petraea, Q. robur, Q. cerris, Q. frainetto, Q. pedunculiflora*) and introduced (*Q. rubra, Q. macrocarpa*).
Phenotypic assessments were conducted 43 years after plantation establishment on survival rate, diameter at 1.30 m height, total height, crown height, stem straightness, trunk shape, and branch insertion angle to characterize interspecific differences in growth performance and form quality.
Survival rates varied widely among species, with *Q. cerris* (67.3%) and *Q. rubra* (60.0%) showing the highest, and *Q. frainetto* (9.5%) the lowest. Statistical analysis revealed significant differences among species for most traits, particularly diameter, total height, and crown height. Native species exhibited larger mean diameters (25.4 cm) and heights (21.4 m) compared with introduced species (22.4 cm diameter, 18.7 m height). Correlation analyses indicated strong associations between diameter and total height (r = 0.70) and moderate associations with crown height (r = 0.32-0.60). Multivariate analysis (PCA) highlighted separation between native and introduced species, while statistical tests showed that some categorical traits were significantly associated with species type. These results suggest that survival, growth performance, and tree architecture differ among species, reflecting their adaptive potential in the common garden experiments.
From a practical perspective, these findings provide a basis for identifying well-adapted and high-performing species suitable for reforestation, urban planting, and climate resilience strategies, contributing to sustainable management and conservation of both native and introduced oak species.
Keywords: oak species, phenotypic traits, common garden, Hemeius Arboretum

Foliar chlorophyll index of oak species in relation to environmental factors in the Romanian silvosteppe

Bogdan-Ionuț PLEȘCA[1,2], Cosmin Constantin LOGHIN[1,2], Ioana-Maria PLEȘCA[1], Dan Marian GUREAN[2], Ovidiu BADEA[1,2]

[1]National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania;
[2]"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: bogdan.plesca@icas.ro

This study investigated the variability of leaf chlorophyll content (SPAD index) among six oak species and its relationship with environmental factors such as air temperature, relative humidity, and light intensity.
The dataset comprised 200 trees from five populations, covering *Quercus robur*, *Q. petraea*, *Q. frainetto*, *Q. pubescens*, *Q. pedunculiflora*, and *Q. cerris*. SPAD index values ranged from 22.9 to 72.6, with a mean of 43.6 ± 3.4.
Statistical analysis revealed significant interspecific differences in SPAD index ($F = 34.38$, $p < 0.001$). *Q. pubescens* and *Q. cerris* had the highest mean SPAD index values (45.4 and 44.6, respectively), whereas *Q. robur* and *Q. petraea* exhibited the lowest (43.5 and 41.7).
A linear mixed-effects model (LMM) accounting for environmental variables and hierarchical random effects of population and individual trees revealed that 7-day averages of air temperature, and relative humidity prior to sampling significantly influenced foliar chlorophyll content.
Overall, the results demonstrate that leaf chlorophyll content varies significantly among oak species and is strongly influenced by microclimatic conditions. Thermophilous species such as *Q. pubescens*, *Q. cerris*, and *Q. frainetto* maintained higher chlorophyll levels under warmer and drier conditions, suggesting greater physiological resilience compared to mesophilous species (*Q. robur*, *Q. petraea*).
These findings emphasize the importance of environmental factors and species-specific traits in determining leaf chlorophyll content and provide valuable insights for ecophysiological studies, especially in the context of climate change.
Keywords: *Quercus*, SPAD index, chlorophyll content, temperature, humidity, light intensity, interspecific variability

New record of the *Sternbergia colchiciflora* Waldst. et Kit. in the spontaneous flora of the Republic of Moldova

Olga IONIȚA, Aliona MIRON, Alexandru GALUPA

"Alexandru Ciubotaru" National Botanical Garden (Institute), Moldova State University, Chisinau, Republic of Moldova.
E-mail: olgaionita.gbn@gmail.com

In the spontaneous flora of the Republic of Moldova *Sternbergia colchiciflora* Waldst. et Kit. from Amaryllidaceae family is a critically endangered species (CR), protected by law (Law No. 1538/1998 on the fund of state-protected natural areas), included in the Red Book of the Republic of Moldova, 2nd and 3rd edition. At the international level it is protected, being included in: Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), cited in The IUCN Red List of Threatened Species (Király et all, 2011), in the Red Book of Vascular Plants in Romania (Dihoru et Negrean, 2009), in the Red Data Book of Ukraine (Novosad et Kritska, 2009). The general distribution of the species includes the Southern Europe and the Caucasus. In the Republic of Moldova it is a threatened species, located at the edge of its range, known only from four localities: from the vicinity of the communes of Merenii Noi (Anenii-Noi) and Copanca (Căușeni), the village of Ciumai (Taraclia) and the commune of Văleni (Cahul). *Sternbergia colchiciflora* grows in the clearings and edges of downy oak forests and on steppe hills, solitary or in groups. A perennial and ephemeral plant. Autumnal geophyte. It blooms in September-October, the appearance of flowers and the abundance of flowering being strictly conditioned by the presence of precipitation, and in drought conditions the flowers develop inside the bulb. It bears fruit in spring, in April, it multiplies by seeds and bulbs. Drought-resistant steppe xerophyte, decorative.

During the floristic field research, carried out on September 20, 2024 on the territory of the "Bugeac" medicinal plant reserve (ATU Gagauzia), a new place of distribution of the *Sternbergia colchiciflora* species was identified. The newly reported population contains over 50 vigorous specimens and occupies an area of about 100 m2. In the fall of 2025, flowering occurred about a month later than in 2024, the cause being the lack of precipitation and low temperatures in September. This sector of the Ponto-Sarmatian steppe dominated by species of the genus *Stipa* L. (*Stipa lessingiana* Trin., *Stipa pennata* L., *Stipa pulcherrima* K.Koch etc.) and *Festuca valesiaca* Gaudin is notable for its high floristic diversity, hosting a considerable number of endangered species, among which *Colchicum arenarium* Waldst. et Kit. which blooms at the same time as *Sternbergia colchiciflora*. The presence of the species in the "Bugeac" medicinal plant reserve completes with new data the chorology of the *Sternbergia colchiciflora* species, an important taxon from a scientific and biodiversity conservation point of view, providing updated information on the species' population and its conservation status.

The research was supported by the Moldova State University through the Project "Research and ex situ, in situ conservation of plant diversity in the Republic of Moldova" (010101) and the project "Assessment of the status of plant and animal species. Development of the list of species with rarity status and its algorithm for their presentation in the 4th edition of the Red Book of the Republic of Moldova", funded by the Ministry of Environment.

Holisoils Project (Holistic management practices, modelling and monitoring for European forest soils): Insights from the Romanian forest soil test site

Ion Catalin Petritan[1], Ioan Dutca[1], Leticia Pérez-Izquierdo[2], Tijana Martinovic[3], Jorge Curiel-Yuste[2]

[1]Faculty of Silviculture and Forest Engineering, Transilvania University of bRasov, Romania

[2]BC3-Basque Centre for Climate Change, Scientific Campus of the University of the Basque Country, Leioa, Spain

[3]Laboratory of Environmental Microbiology, Institute of Microbiology of the Czech Academy of Sciences, Praha 4, Czech Republic

E-mail: petritan@unitbv.ro

The HoliSoils project has monitored forest soils following simulated disturbances and the application of various post-disturbance treatments. Several sites across Europe were selected for these experiments. In Romania, the test site consisted of a pure pedunculate oak stand located in Dumbrăvița village, Brașov County. The experimental site covers an area of approximately 1.5 ha, within which three 0.12 ha plots were established and replicated across four blocks. The treatments included: a control (no canopy disturbance), 50% tree removal, and 100% tree removal. The disturbed treatments (50% and 100% removal) were further divided into two halves: in one half, the slash resulting from logging was crushed and left on the ground as mulch (mulching), while in the other half, all woody debris was removed. Three sampling campaigns (2022, 2023, and 2024) have been conducted annually since the establishment of the treatments. During each campaign, the physical, chemical, and microbiological parameters of the soil were analyzed. Soil respiration was measured monthly using an EGM-5 device, while soil water content and temperature were recorded with TMS loggers. The effects of the disturbances on soil properties were generally low; however, the 100% canopy disturbance treatments increased soil respiration rates, particularly when slash was added to the soil. Complete canopy disturbance also increased soil moisture, regardless of slash addition, while the temperature sensitivity of soil respiration did not vary under any of the disturbance or post-disturbance treatments. Fungal and bacterial biomass remained unchanged across treatments, and enzymatic activities were only marginally affected. The canopy and post-disturbance treatments had the least impact on the soil at the Dumbrăvița site, which is characterized by a long rotation period (150 years), lower tree density but larger trees, overall lower bulk density, and smaller carbon stocks. These results suggest that adopting forest management practices based on longer rotation cycles may be the most effective strategy to conserve soil properties, functioning, and biodiversity in the face of increasing natural disturbances affecting European forests.

Shifts in steppe and forest-steppe phytoclimatic zone boundaries in southern and southeastern Romania (1961–2020)

Constantin-Cosmin LOGHIN[1,2], Corina ENACHE[1], Florin ACHIM[1], Nicolae Ovidiu BADEA[1,2]

[1]National Institute for Research and Development in Forestry "Marin Drăcea", Voluntari, Romania;
[2]"Transilvania" University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: cosmin.loghin@yahoo.com

This study investigates the dynamics of steppe and forest-steppe phytoclimatic boundaries in southern and southeastern Romania over the period 1961–2020, emphasizing the ecological and forestry implications of their migration under changing climatic conditions. The main objective is to quantify the spatial displacement of these zones and identify the climatic drivers influencing their evolution. Long-term datasets from regional meteorological stations were analyzed using temperature, precipitation, and aridity indicators, such as De Martonne aridity index. Phytoclimatic zonation was reconstructed for representative time intervals and integrated into a GIS-based framework to evaluate spatial and temporal trends in boundary migration.

The results reveal a northward and northwestward shift of both steppe and forest-steppe boundaries, indicating an expansion of xeric steppe conditions at the expense of mesophilous forest-steppe vegetation. The observed displacement is asociated with an increase in mean annual temperature of approximately and a gradual reduction in annual precipitation. These climatic trends reflect a regional tendency toward aridization, reshaping the ecological balance of transitional zones and modifying the potential distribution of key forest species such as *Quercus pedunculiflora*, *Quercus pubescens* and other asociated species.

From a forestry and ecological standpoint, the northward migration of steppe environments poses significant challenges for forest regeneration, productivity, and biodiversity conservation. The findings highlight the necessity of developing adaptive silvicultural strategies, integrating drought-tolerant species, and revising afforestation plans in response to evolving phytoclimatic regimes. This research contributes to a broader understanding of climate-induced ecosystem shifts in Eastern Europe and offers a scientific foundation for evidence-based forest management and conservation policies under projected future warming scenarios.

A Carbon Monitoring Framework for 'Kremenetski Hory' National Park in Ukraine

Ihor BUKSHA, Volodymyr PASTERNAKA, Tetiana PYVOVAR, Taras BUKSHA

Ukrainian Research Institute of Forestry and Forest Melioration named after G.M. Vysotsky, 86 Grigory Skovorody str., 61024 Kharkiv, Ukraine;
State Biotechnological University, 44 Alchevskyh, 61002, Kharkiv, Ukraine
E-mail: buksha@uriffm.org.ua

Forests are major terrestrial carbon sinks and play a vital role in achieving climate neutrality under the Paris Agreement. Ukraine's forest potential allows for significant contributions to global climate mitigation through improved management and the forest conservation. Reliable carbon accumulation monitoring is crucial for implementing forest-based carbon projects and participating in climate finance mechanisms.

This study assessed carbon sequestration in tree phytomass and established baseline carbon stock data for 'Kremenetski Hory' National Park (NP) to support long-term carbon monitoring and ecosystem restoration evaluation. Field studies (2024) were carried out in the beech and hornbeam-oak forests of the Ternopil region of Ukraine. Circular monitoring plots with concentric subplots were layed. Tree species, diameter, height, and vitality were recorded, and biomass was calculated using national allometric equations. Underground biomass was estimated using above-/belowground ratios, and coarse woody debris was classified by decomposition stage. Seven plots included 302 trees (11 species). Mean growing stock ranged from 234–379 $m^3 \cdot ha^{-1}$. Total carbon stock averaged 98.3 $tC \cdot ha^{-1}$ in living biomass and 5.8 $tC \cdot ha^{-1}$ in dead wood, with stems containing 88.7% of total carbon. On average, 83% of carbon was stored in aboveground biomass, 12% underground, and 5% in dead organic matter. Dead wood volume averaged 23.6 $m^3 \cdot ha^{-1}$, mainly moderately decomposed debris. Regeneration was dominated by maples (*Acer platanoides*, *A. pseudoplatanus*), while understory beech plantations showed low density (<1,000 $stems \cdot ha^{-1}$).

The study developed and tested a practical approach for forest carbon monitoring within a protected area. The obtained baseline data enable future carbon balance assessments and support forest restoration and adaptation strategies under climate change.

Keywords: carbon monitoring, forest ecosystems, *Fagus sylvatica*, phytomass, dead wood, Ukraine.

Tree-ring-based mapping of oak bioregions in forests of Eastern Romania: A key step in assessing forest vulnerability to climate change.

Andrei MURSA, Ciprian PALAGHIANU, Marian-Ionuț STIRBU, Mihai-Gabriel COTOS, Viorica NAGAVCIUC, Cosmin-Mihai ANDRIESCU, Maria-Ecaterina ASANDEI, Victor SFECLA, Catalin-Constantin ROIBU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: andrei.mursa@usm.ro

Here we present 31 dendrochronological series for oak from eastern Romania and the Republic of Moldova, series made according to established research methodology. Based on these series, distinct bio-regions were created for oak using growth indices. For this purpose, modern statistical methods were used, namely principal component analysis (PCA), hierarchical cluster analysis (HCA) using the Ward distance method, and redundancy analysis (RDA). After applying these statistical methods, three distinct bio-regions were identified for oak. The bio-regions delimited by growth indices for oak allowed us to identify three homogenous areas from the point of view of growth processes, which overlap the main landforms and have strong climatic determinism, being delimited by the aridification trends of the last period. Within the identified bio-regions, an association of these could be observed with the main climatic parameters, but also with the physical-geographical parameters (longitude, latitude and altitude). According to the climatic conditions, the growth of oak trees is positively influenced by the main climatic parameters as follows: temperature for the high altitudinal series; and the precipitation amount in the hill and plain areas.

The relation between NDVI and Tree-Ring Width of *Picea abies* (L.) from Eastern Carpathians, considering the influence of local climate conditions induced by elevation

Emilian STOICA[1], Ionel POPA[2], Andrei POPA[2]

[1]"Ștefan cel Mare" University of Suceava, Forestry Faculty, Suceava, Romania;
[2]National Institute of Research - Development in Forestry *"Marin Dracea", Voluntari, Romania.*
E-mail: emystoica0@gmail.com

Understanding forest dynamics in the context of climate change and mitigating the effects of disturbances on trees requires complementary approaches; in this regard, the integration of remote sensing and dendrochronology data can be particularly valuable. Norway spruce (*Picea abies* (L.) Karst.) is an important species that is increasingly affected by drought in the European forests, with the degree of impact varying according to latitudinal or elevational gradients. The Eastern Carpathians represent the southeastern edge of the spruce occurrence in Europe, and a particularly important area for this coniferous species.
To assess the relationship between NDVI (as a proxy for leaf biomass) and tree ring width (as a proxy for wood biomass), we used a network of fifteen forest sites situated along an elevation gradient of 1,112 m. Our aim was to examine: (i) the potential mismatch between NDVI and TRI induced by climate, (ii) the changes in the relationship between NDVI and TRI along the elevation gradient, and (iii) the relationship of TRI with temperature and SPEI, as well as (iv) the relationship between NDVI and these climatic variables.
The results showed a generally weak relationship between NDVI and TRI for Norway spruce in the Eastern Carpathians, although this linkage is stronger with elevation. Climatic factors (temperature and water availability - SPEI) are strongly related to NDVI during summer and to TRI during spring. Overall, while this approach offers valuable insights, it should be implemented with caution and supplemented by the inclusion of additional variables to fully capture forest ecosystem dynamics.
Keywords: remote sensing, climate signal, growth responses, radial growth, canopy.

A protocol for high-quality slides for coniferous tree-ring anatomy

Maria-Ecaterina ASANDEI, Marian-Ionuț ȘTIRBU, Andrei MURSA, Cosmin ANDRIESCU, Mihai-Gabriel COTOS, Cătălin-Constantin ROIBU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: maria.asandei@usm.ro

In a global context where climate change represents a major challenge for both the environment and society, studies based on dendrochronological and quantitative wood anatomy analyses hold significant importance. Research based on this method of wood analysis contributes meaningfully to the reconstruction of past climatic parameters, providing valuable insights for anticipating future climatic developments.
Quantitative wood anatomy (QWA) is a meticulous method for analyzing the variability of anatomical features of the wood found in trees, shrubs and herbaceous species. The purpose of such analyses is to highlight and understand the functioning, growth, and adaptation mechanisms of wood species to environmetal conditions, as well as the evolution of these processes over time. Tree-ring structures serve as a primary archive for storing and encoding variable climatic data. Once matured, the anatomical structure of the wood remains unchanged, allowing intra-anual resolution information to be extracted regarding auxological growth processes-particularly relevant in the current context of climate change. In other words, applying such a method requires meticulous work, precision, and increased attention to the preparation of plant material, with the aim of obtaining high-quality images in order to translate the information stored in the annual rings as accurately as possible.
For this study, a tree species from the conifer category was selected, namely *Pinus cembra* (Swiss stone pine). This paper presents a steb-by-step description of the working protocol for quantitative wood anatomy directly referring to the process of collecting the plant material, its subsequent processing, obtaining microsections and scanning them, follwed by the analysis of anatomical parameters using the software Roxas. Additionally, two essential aspects for applying this method are emphasized – the importance of methodological accurcy for obtaining high-precizion data (to minimize mesurement errors of the anatomical parameters) and the necessity of using modern technologies in such analyses.

Four centuries of temperature variability revealed by tree-ring proxies of *Pinus cembra* from the Retezat Mountains

Marian-Ionuț ȘTIRBU, Cătălin-Constantin ROIBU, Andrei MURSA, Mihai-Gabriel COTOS, Cosmin-Mihai ANDRIESCU, Maria-Ecaterina ASANDEI, Ionel POPA

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: marian.stirbu@usm.ro

Understanding past climate variability is fundamental for evaluating the long-term impacts of climate change on forest ecosystems. Since instrumental climate records are limited to the recent period, the tree-rings provide one of the most reliable sources of at least annually resolved proxy data. This study provides a multi-proxy approach (tree ring width, anatomical traits and maximum latewood density) reconstruction of summer temperature variability in the Retezat Mountains (Southern Carpathians, Romania) based on *Pinus cembra*.
The chronologies revealed contrasting proxy sensitivities: TRW exhibited weak climatic signals, whereas MXD and anatomical parameters (e.g., cell-wall thickness, lumen area) showed strong and temporally stable correlations with July–August temperatures (r = 0.68 and r = 0.58, respectively). Due to the low temperature sensitivity of TRW, only MXD and CWT were used in the reconstruction model. The combined multiproxy approach explained 56% of the variance in observed temperatures (r = 0.75) and yielded positive RE and CE values (0.46 and 0.45), confirming strong predictive skill. The resulting reconstruction spans 1623–2015 and captures major climate episodes, including late–Little Ice Age cooling (1623–1850), the Dalton Minimum (1760–1850), and pronounced post-1980 warming, culminating in the warmest reconstructed summer in 2012 (+2.68°C above the 1961–1990 mean).
By integrating dendrochronological and anatomical proxies, this study reveals complementary auxological processes underlying P. cembra growth under temperature-limited conditions. The findings demonstrate the potential of wood anatomical parameters to refine temperature reconstructions and detect climate-induced changes in growth strategies, contributing valuable long-term context for understanding ongoing and future dynamics in Southern Carpathian tree-line ecosystems.

The influence of climate change on oak trees within the Strășeni Forestry and Hunting Entity

Grati V.[1,2], Railean V.[1], Bejan Iu.[1], Roibu C-C.[2]

[1]Moldova State University, Republic of Moldova;
[2]Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: grativlad@yahoo.com

Prolonged droughts resulting from climate change pose a real threat to forest vegetation. The continuity and structure of forests can vary over time. Knowledge of climate scenarios is necessary for the promoting of forest species. Researchers from the Republic of Moldova have developed the Atlas "Climate Change and the Current State of Landscapes" and the baseline scenario of the AR6 report of the Working Group WG1 of the Intergovernmental Panel on Climate Change IPCC AR6 WG1. The reference periods refer to past climate events (1986 - 2005), data collected by the State Hydrometeorological Service and possible changes for the periods 2021-2040, 2041-2060, and 2081-2100. The relevant scenarios refer to RCP2.6, RCP4.5 and RCP8.5 with the elimination of intermediate ones. These cartographic materials are produced at a spatial resolution of 200 m, with 5 seasonal intervals for temperature.
The scenarios predict a different value for the average global temperature increase. Thus, according to the AR6 Report [2], for the RCP2.6 scenario, a temperature increase by 0.7°C is predicted by 2040, for the RCP4.5 scenario – also by 0.7°C, and according to the RCP8.5 scenario – the global average annual temperature will increase by 0.8°C.
The adaptation of oak species to new climatic realities is urgently needed. The drying of oak in the context of aridification must be studied from the perspective of each region. This phenomenon should not be generalized.
Keywords: Drought, climate changes, species, temperature, rainfaill.

Structure and dynamics of radial growth in a pedunculate oak (*Quercus robur* L.) stand in the Cărpineni Forest District

Victor SFECLĂ[1,2], Irina SFECLĂ[1], Alexei JOSAN[1,2], Andrei MURSA[2], Catalin-Constantin ROIBU[2]

[1]Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences;
[2]Forestry Faculty, Stefan cel Mare University of Suceava.
E-mail: victor.sfecla@spp.utm.md

The pedunculate oak (*Quercus robur* L.) forests of south-central Moldova developed under warm, arid conditions on the southern and southeastern hilly spurs of the Codri uplands (Forestry Districts of Cărpineni, Mereșeni, Bozieni, Anenii Noi, Zloți, Cantemir, and Baimaclia). The examined forest is a pure, even-aged oak stand, 110 years old according to the forest management plan. It is naturally regenerated and of fundamental type, with an area of 2.0 ha. The site lies on an undulating lower slope with a southern aspect, a gradient up to 6°, and an elevation of 183 m above sea level. The soil is a typical clay-illuviated chernozem. Across the stand, the diameter distribution is polymodal. Tree numbers fluctuate across the 16–48 cm and 68–72 cm diameter at breast height (DBH) classes, with peaks at 24, 28, 32, and 36 cm. This pattern is typical of natural forests and reflects light competition among mid- and lower-canopy trees, together with the absence of harvesting; older trees remain standing and enter decline. The results suggest that regeneration in the smallest diameter classes is influenced less by competition per se than by the presence of overstory trees (a shelter effect). The height structure is two-layered. Heights were grouped into 2-m classes. Tree numbers from the lower to middle classes are relatively high, peaking at 12 m and a smooth transition among adjacent classes. The near-uniform counts in the lower layer likely reflect horizontal canopy closure and a terminal development phase in which regeneration is prominent. Increment cores were used to develop ring-width series for the stand. The series shows the signal typical of open-grown (isolated) trees or low-density stands. Pronounced drought-related growth declines are evident in 1946–1947, followed by post-disturbance recovery. After removing age-related trends (detrending), periods of climatic extremes are more clearly resolved: c. 1929; 1946–1947 (the Great Famine); c. 1995; and 2003. The most severe growth depression occurred in 1946–1947. In this area, pedunculate oak shows only a weak overall response to local climate. This likely reflects the plot-selection criterion prioritising mean stand age over site conditions. Even so, some climatic factors affect growth: precipitation in the prior year helps predict radial growth (ring width). Seasonal analysis indicates that conditions in November of the preceding year positively affect current-year radial growth (r = 0.287). This is physiologically plausible, as carbohydrates stored in late autumn provide reserves that fuel the reactivation of cambial division. Regarding precipitation, rainfall during the late-season months at the end of the previous growing season strongly affects oak growth in the study area. A further aim was to describe the dynamics of radial growth captured by the tree-ring chronology; in line with this aim, we identified marked drought-induced growth reductions in 1946–1947 and the subsequent recovery phases.
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Dendrometric and Auxological Research in Poplar Riparian Stands from the Prut River Floodplain

Sergiu-Georgian CÎRLIG, Cătălin-Constantin ROIBU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: cirlig.sergiu3598@gmail.com

Introduction. Poplar species from the Prut River floodplain area, located at the edge of their natural range, are considered fragile ecosystems. In this context, biodiversity conservation and the application of ecological forestry principles, fundamental to natural forest structure, are essential aspects for the sustainable management of these resources. Foresters of the current generation face significant challenges in managing natural and artificial stands specific to floodplains, especially when these have exceeded the harvesting age and exhibit various structural problems.
Research location. The research was conducted in artificial stands of Eurasian poplar and locust, as well as in natural stands of locust and oak where regeneration cuttings have not yet been done. The study areas are located in Iași County — UAT Bivolari, Trifești, and Victoria — under the administration of Direcția Silvică Iași, Ocolul Silvic Iași, U.P. IV Bivolari, and U.P. V Medeleni.
Research method and methodology. Studying the structural and dendrometric components of trees in the Prut River floodplain is a complex process requiring specific research methods that combine classical techniques (observation, experiment) with modern approaches, such as simulation and mathematical modeling. The research methodology will include general statistical methods (correlation analysis, regression, variance analysis, principal component analysis, correspondence analysis, etc.) and specific methods for analyzing stand structure.
To identify the structural characteristics of the Prut River floodplain, the following methodological aspects were used:
1. Analysis of the experimental distributions of the main biometric characteristics of trees, by fitting theoretical distribution functions corresponding to horizontal and vertical structure;
2. Studying the spatial organization of trees using the point process method, the Ripley function, and bi-dimensional profiles;
3. Quantifying the spatial variability of competition relationships among trees.
Another analytical approach focuses on structural diversity, using the following indicators: Shannon-Wiener index, maximum possible diversity index, Pielou's evenness index, diameter differentiation index, and diameter dominance index.
To test structural homogeneity in relation to basal area, the Camino and Gini indices will be applied.
Conclusions. It is anticipated that the research will confirm the hypothesis that Euro-American poplar stands exceeding the harvesting age show significant decreases in growth rate and enter a process of progressive physiological decline, which eventually leads to tree mortality and the loss of economic value.
For oak and black locust, an increased risk of damage due to climate change is expected, particularly as a result of prolonged high summer temperatures, which may negatively affect the physiological processes and stability of these species in the Prut floodplain.

Placemaking for Climate Mitigation

Mihai ANDROHOVICI, Anca Oana SEREDIUC

Association Sport for All Suceava, Romania.
E-mail: ajsptsv@yahoo.com

The Placemaking for Climate Mitigation project promotes democratic values, fosters inclusion and encourages civic participation by involving stakeholders at different levels in deliberations on climate and our environment, by supporting the development of new "green" policies and by encouraging a "green" way of life. In particular, it stimulates engagement through awareness-raising campaigns, conferences, workshops, etc. on the topic of the environment; gathers the views of various stakeholders through public deliberations, online tools, conferences; promotes exchanges between citizens from the partner countries – Bulgaria, Romania, Greece – to encourage a better understanding of different perspectives; identifies possible solutions and recommendations on the topic of the environment for local, national and EU authorities.

Oak species dendroclimatic patterns and resilience to drought in South-Eastern Romania

Andrei POPA, Ionel POPA

National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania.
E-mail: popa.andrei.dorna@gmail.com

Increasing warming-related drought frequency and severity impact tree growth in lowland forest ecosystems. Oak species are the key species in forests in steppe and forest-steppe regions, ensuring high biodiversity levels and ecosystem functionality under limited climatic conditions. In this study, we evaluate the effect of climatic factors on the basal area increment and drought resilience of five native oak species (*Quercus robur*, *Quercus pedunculiflora*, *Quercus frainetto*, *Quercus pubescens*, *Quercus cerris*) and one exotic oak species (*Quercus rubra*) in the forest-steppe zone of southeastern Romania. To assess the climate-growth relationships we used bootstrap Pearson correlation between BAI and aggregated daily climatic factors (i.e., temperature, precipitation, Standard Evapotranspiration- Precipitation Index). The temporal shift of climate sensitivity was evaluated through the difference in climate response between two periods (i.e., 1961-1990 and 1991-2020). For resilience to extreme drought (SPEI <-1.5), we used classical Loret resilience indices. All oak species exhibit a significant response to previous autumn, spring, and summer drought, with an increasing correlation intensity in recent decades. A negative correlation with summer temperature is observed only after 1990, for all native oak species. *Q. rubra* has no significant correlation with temperature. Growth synchrony between trees is higher and stable over time for *Q. cerris* and *Q. rubra*. In contrast, *Q. robur* and *Q. pedunculiflora* show a decline in inter-series correlation after 1990. *Q. frainetto* shows the highest resistance to extreme drought, while *Q. rubra* has the lowest. The recovery rate after water deficit periods is high for *Q. robur* and *Q. pubescens*. Overall, *Q. frainetto* fully recovers after extreme drought (mean resilience index >1), whereas the lowest resilience is observed in *Q. cerris* and *Q. rubra*. Our results indicated similar resilience and adaptability to extreme drought conditions for *Q. robur*, *Q. pedunculiflora*, *Q. frainetto*, and *Q. pubescens*, while *Q. cerris* and *Q. rubra* are the most vulnerable ones in the forest-steppe zone of South-Eastern Romania.

Biological implications on *Lumbricus terrestris* communities in soil polluted with heavy metals

Adelina Ecaterina BANTAȘ, Corneliu Mihăiță POHONȚU

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: adelinabantas2511@gmail.com

Organisms ranging from microorganisms to plants and animals interact closely with soil, making them highly susceptible to pollution. These interactions are essential in regulating how pollutants spread, accumulate, or break down within ecosystems. The aim of this experiment is to observe the effects of heavy metal pollution on soil using *Lumbricus terrestris* as a bioindicator species. This species is particularly suitable for such studies due to its direct contact with the soil and it's role in soil aeration and nutrient cycling. The experiment evaluates how different concentrations of heavy metals—specifically lead (Pb) and zinc (Zn)—affect the biometric and behavioral parameters of earthworms.

Evaluation of contamination by heavy metals through bioaccumulation and biomagnification in the avifauna of the Fălticeni area

Emilian STOICA, Corneliu Mihăiţă POHONŢU, Ionuţ BARNOAIEA

Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: emystoica0@gmail.com

Heavy metals are environmental pollutants originating from both anthropogenic activities and natural processes, present in varying concentrations. They can bioaccumulate and biomagnify along the food chain, ultimately affecting biodiversity. Avifauna, with their unique ecological and physiological traits, can serve as effective bioindicators for these pollutants. This study aims to detect the presence and concentration of 3 heavy metals: Pb, Fe and Cd in the feathers of three avifauna species: *Pica pica*, *Garrulus glandarius*, and *Buteo buteo*, from the Fălticeni town area. The sampling area is characterized by various sources of heavy metals, including urban environments, industrial zones and intensive agricultural practices. To achieve this purpose, the following objectives were pursued: Inventorying the avifauna by identifying species based on feathers and assigning their specific geolocation; Conducting a spatial analysis of the area by determining the percentage of land use classes and industrial sources and highlighting the potential for bird contamination; Performing Graphite furnace atomic absorption spectrometry analysis of the samples. Finally, interpreting and correlating the laboratory analyses with the presence and concentration of the pollutant and the type of species. Based on the results, this study seeks to underscore the importance of monitoring heavy metals to understand their impact on biodiversity.
Keywords: heavy metals, biodiversity, bioindicators, anthropogenic activities, avifauna.

Response of Japanese larch (*Larix leptolepis* Gord) radial growth to climate change in the Left-Bank forest-steppe, Ukraine

Iryna KOVAL[1], Nadiya MAKSYMENKO[2], Nadiya CHERKASHYNA[2], Vadym GOLOLOBOV[2], Olena ANDREIEVA[3]

[1]G.M. Vysotsky Research Institute of Forestry and Forest Melioration, Kharkiv, Ukraine;
[2]V. N. Karazin Kharkiv National University, Kharkiv, Ukraine;
[3]Polissya National University, Zhytomyr, Ukraine Affiliation.
E-mail: koval_Iryna@ukr.net

The research presents the response of Japanese larch (*Larix Leptolepis* Gord) radial growth to climate change in the conditions of the Forest-Steppe of Ukraine in the Arboretum planting at the State Biotechnological University. Two-year-old seedlings of Japanese larch were obtained from the forestry of the Lviv Forestry Institute in 1973 The climate is temperate continental with unstable humidity. The average annual air temperature is +6.5 °C with fluctuations from +38 to −35 °C. The average annual precipitation is 520 mm.

It was developed local-tree chronologies of early, late and annual wood, considering three periods: 1979-1993, 1994-2008 and 2009-2022. For dendroclimatic analysis, correlation analysis was applied between the indices of early, late and annual wood on the one hand, and temperatures and precipitation for the hydrological year on the other hand. Moreover, for correlation analysis between index chronologies and climatic factors the research used the average, minimum, maximum temperatures and precipitation amounts for the hydrological year, relative humidity and precipitation amounts for April-August, for winter period – hydrothermal coefficients (de Marton's drought index (DM), Seljanin's hydrothermal coefficient, Standardized Precipitation Index (SPI), Forestry Aridity Index (FAI), hydrothermal coefficients O1 and O3).

A correlation analysis) was conducted between the indices of early, late, and annual wood and climatic factors (temperature, precipitation, and hydrothermal coefficients for the same periods from June of the previous year to August of the current year.

The results have showed that in the third period (2009-2022) the sensitivity of radial growth of trees to climate variations increased, as evidenced by an increase in the number of significant correlation coefficients between index tree-ring chronologies and climatic factors (temperatures and precipitation) and hydrothermal coefficients. This indicates a plantation weakening. Early wood was most sensitive to climate variations. The radial growth trend stabilized in 2019-2022. It is necessary to continue dendroclimatic studies of Japanese larch in the Forest-Steppe in order to identify the adaptive capabilities of this species to climate change more accurately.

Preliminary results regarding the current characteristics of forest sites in the forest-steppe and plain areas of the Ialomița River floodplain

Mihaita BITCA[1,2], Gabriel DUDUMAN[2], Florin DANESCU[1], Dorina DRAGAN[1], Adrian TUDORA[1]

[1]National Institute of Research - Development in Forestry "Marin Dracea", Voluntari, Romania; [2]Forestry Faculty, Stefan cel Mare University of Suceava, Romania.
E-mail: bitcamihaita@gmail.com

In recent decades, the characteristics and productive potential of forest sites, as well as the forest types found in the floodplains of Romania's major rivers, have been significantly affected by human interventions and associated hydrological and ecological changes. These have manifested through a drastic decline in groundwater levels, often below the depth accessible to vegetation, and through the loss of the natural flooding regime, in some cases permanently.
In this context, the soils and forest sites in these areas have undergone such profound transformations that they no longer correspond to the classical typology of floodplain forest sites developed four to five decades ago.
The impact of these changes is particularly pronounced in the southern part of the country, which makes the results of investigations conducted in this area relevant not only for the studied inland floodplains but also, by extrapolation, on a national scale.
This paper aims to analyze the current site characteristics of the Ialomița River floodplain (in the plain and forest-steppe regions), with the purpose of reassessing site suitability for forest vegetation, substantiating regeneration compositions, conserving valuable ecosystems, updating the typology of inland floodplain sites, and optimizing methods for site mapping.
This paper presents the working methodology adopted for the study of forest site characteristics in the forest-steppe and plain areas of the Ialomița River floodplain, as well as a series of preliminary results. These results confirm the importance and necessity of such research and will be complemented by additional field analyses to cover the entire study area.

Forest aridity stress index – interpretation and application (case study: the Dniestre Forest - Steppe Plateau)

Ala DONICA, Nicolae GRIGORAȘ, Cristina BRAȘOVEANU

Laboratory "Natural and Anthropogenic Ecosystems", Institute of Ecology and Geography, State University of Moldova.
E-mail: aladonica1980@gmail.com

The forest ecosystems vulnerability to climate change can be expressed through various eco-climatic indices. The present study maps and interprets the Forest Aridity Stress Index (FASI), developed at regional level (Nedealcov M., 2020). Depending on the FASI values, territories with normal climatic conditions, specific to the natural zone, or territories with arid climatic conditions, stressful to forest species, which induce the triggering of risks, associated with climate change, such as: vegetation fires, the spread of pests, tree crown defoliation, foliage discoloration, etc. are delimited.
The FASI calculation formula is given by the ratio between evapotranspiration and relative air humidity in the months of May-August:
FASI=((EoV + EoVI+ EoVII+ EoVIII))/((RV+RVI+RVII+RVIII))
where: Eo- evapotranspiration or potential evaporation in the named months (V-VIII);
R- relative air humidity in these months (Nedealcov M., 2020).
According to the physical-geographical regionalization of the Republic of Moldova (Boboc N., 2019), the Dniester Forest-Steppe Plateau occupies the Răut-Dniester interfluve (maximum altitude 350 m). The relief is moderately fragmented by a system of narrow valleys and ravines, erosional processes, landslides and karst processes are widely developed. Average annual precipitation exceeds 600 mm. The average temperature of January varies from -4.5C in the north to -3.5C in the south, of July, 19.5C in the north and 20C in the south of the plateau. On gray soils there are sessile oak and hornbeam forests in the south and sessile oak and cherry in the north (11.0% of plateau surface occupies forests).
The annual FASI values obtained for the Dniester Plateau, period (1980-2020), vary depending on the parameters influencing the climate (landforms, slopes, exposure, etc.), and constitute 1.3-2.5 units (the lowest values are in territories with altitudes below 140 m, and the highest values – in the northeastern extremity of the plateau).
According to reference data (Nedealcov M., 2020), the presence of 2 sectors with distinct climates is indicated on the plateau: 1) sectors in which the climatic conditions of the „critical" vegetation period (May-August) are considered normal (FASI values below 1.9 units); 2) sectors where the current climatic conditions are considered relatively arid (FASI values above 2.0-2.5 units). In a multi-annual aspect (1980-2020), FASI values indicate the presence of relatively arid stress conditions (starting with the year 2000), associated with several climate change risks (droughts, fires, pest invasions, etc.). The years with the most significant FASI values are as follows: 2000, 2007, 2012, 2015, 2017, 2018, etc. when arid and exceptionally arid, stressful conditions were established for the country's forestry sectors.
The manifestation of unfavorable weather conditions, drought during the active vegetation period, as well as the impact of other biotic (insects, fungi) and abiotic (pollution) factors caused mild-moderate damage (according to the parameter of crown defoliation and foliage discoloration) in the oak trees of the "Pohrebeni" Landscape Reserve, located on the Dniester Plateau.

Recent climate studies (Atlas. Climate change and the current state of landscapes, 2021; Donica A., et al., 2023), indicate obvious climate aridification trends for the Dniester Plateau. In the three climate scenarios (RCP 2.6, RCP 4.5 and RCP 8.5) for the summer season, obvious changes in the average annual temperature and the average annual amount of precipitation are forecasted for future periods (2041-2060 and 2081-2100). These changes have to be analyzed in correlation with the climatic parameters, optimal for the development of mesophytic tree species, predominant in the forest ecosystems of the plateau.

Through the climate scenarios, which indicate climate aridification, we assume that on the Dniester Plateau more and more territories will be classified as those with arid climatic conditions (FASI over 2.0 units). This fact will favor the expansion of the areas occupied by meso-xerophyte and xerophyte species (especially for territories with altitudes below 200m). However, we indicate that the forest ecosystems on the Dniester Plateau will feel the impact of climate change in combination with other abiotic and biotic factors, such as decreasing groundwater, absence of floods, air and water pollution, non-adaptation of forestry practices, the impact of defoliating insects, diseases, wildfires, etc. Therefore, complex/integrative ecological scientific research is necessary to establish sustainable management of the forest sector, including the identification of tree species that will resist and develop in the new environmental conditions.

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Ecological valence and toxi-tolerance of edifying tree species in urban green spaces from the Republic of Moldova

Valeriu BRAȘOVEANU, Nicolae GRIGORAȘ

Institute of Ecology and Geography, Moldova State University, Republic of Moldova.
E-mail: valeriubrasoveanu@yahoo.com

The impact of climate change, air pollution, habitat degradation and other environmental changes, present limiting factors for the edifying tree species in urban green spaces. Depending on the ecological valence and ecological tolerance of the edifying species, sustainable solutions can be proposed regarding the green spaces quality, the ecosystem services maintenance and the population health improvement in urban environments.

To achieve these objectives, for the Republic of Moldova, the areas covered with forest vegetation in 6 cities, located in three zones of the country, were studied: northern area (Edineț municipality – "V. Alecsandri" Public Garden and Bălți municipality – "M. Volontir" Park and "Victoria" Park); central area (Orhei city – "Ivanos" Park and "Orhei" Public Garden; Chisinau municipality – "Alunelul" Park) and south/southeast area (Ștefan Vodă city – "Kizil" Park, "M. Eminescu" Park and "I.Palancean" Forest-Park; Cahul municipality – "Gr. Vieru" Park and "Veteranilor" Park). In the studied green spaces, as in most green spaces of the country, the edifying tree species are: *Fraxinus excelsior*, *Ulmus minor*, *Salix alba*, *Pinus nigra*, *P. sylvestris*, *Robinia pseudoacacia*, *Acer campestre*, *A. platanoides*, *A. pseudoplatanus* and *Tilia spp*.

The study focused on identifying the limiting ecological factors for building species (climate, soil, relief, air pollution, etc.), results that will help establish the foundations for sustainable, resilient and healthy cities. Thus:

Robinia pseudoacacia, a species extremely tolerant to different soil types, except for arid environmental conditions. It grows in a variety of habitats, including forests, disturbed areas and roadsides. The species has average toxitolerance to SOx, NOx pollution and is not among the species highly resistant to heavy metal pollution. Climate aridification will be a limiting factor for the species in the green spaces of the south and southeast of the country.

Fraxinus excelsior grows best on soils rich in nitrogen, calcium, magnesium and phosphorus and does not thrive on acidic soils and very compacted soils. Very tolerant of seasonal flooding, but not prolonged flooding. It is one of the most resistant species to heavy metal pollution. Therefore, soil degradation through compaction and climate aridification may become the limiting factor for ash in green spaces.

Ulmus minor has a clear preference for water- and nutrient-rich soils, distributed mainly near rivers and streams or on floodplains, growing better on slightly acidic soils. *Ulmus spp.* has a higher tolerance to flooding than ash, but less than *Salix spp.;* it prefers cool summers, but is also tolerant of short-term stresses (such as waterlogging or drought). It shows a high capacity to metabolize SOx and NOx.

Salix spp. inhabits wetlands and floodplains, but can tolerate a variety of soils. It is a riparian species of temperate climate, with mild winters, warm summers with short periods of drought. *Salix spp.* as a bioindicator of pollution has a greater capacity to accumulate noxious substances than most woody species. Climate aridification will present a limiting factor for the species in all urban areas surveyed, with more pronounced accents for the south and southeast of the country.

Pinus nigra and *Pinus sylvestris* are species that tolerate a variety of soils, from podzolic sands to limestone, resistant to pollution, soil erosion and landslides. They can grow in both extremely dry and humid habitats, with considerable tolerance to temperature fluctuations. Scots pine shows low capacity to metabolize SOx and NOx and MG noxes. Black pine is more resistant to pollution and soil erosion and is frequently used in reforestation projects in urban and industrial areas. In the context of green spaces, black pine is recommended as a species very resistant to pollution.

Acer campestre with wide ecological valences, is favored by a warm climate, but can tolerate extreme negative temperatures. It is frequently found in hedgerows, forests and field edges, which indicates its adaptability and ecological resistance. This species is tolerant of urban pollution, making it suitable for planting in the country's cities.

Acer platanoides, is intolerant of low nitrogen conditions in the soil, high evapotranspiration or prolonged drought and is rarely found on acidic soils. It is valued for its ornamental value, providing shade and often planted in landscaping and urban environments.

Acer pseudoplatanus usually occurs on nutrient-rich soils. It is not able to thrive in regions prone to drought. The sycamore is a hardy tree, which tolerates exposure to industrial pollution, especially from urban environments, and its strong roots make it excellent for mitigating soil erosion. It has a high threshold of toxitolerance towards the main air pollutants.

Tilia spp. prefers well-drained, fertile soils, but can also be found on infertile soils. It prefers cool and humid environments, but is quite tolerant to drought and shade; of the 3 species of lime trees in green spaces, the silver lime tree exhibits the best drought resistance. The distribution area of these species may increase in a warming climate. *Tilia spp.* exhibits medium capacity to metabolize SOx and NOx and high for some heavy metals.

Thus, aridification and atmospheric pollution will have an impact on the vegetation of green spaces, especially during the critical vegetation period of stands (June-August), with the production of changes in the sensitivity of forest species to water deficit in synergy with atmospheric nox, competition with other invasive species and the potential for adaptation to environmental changes.

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Carici Pilosae-Carpinetum Betuli Neuhausl et Neuhauslova-Novotna 1964 (*Carpinion Betuli* Issler 1931) in the "Dobruşa" Landscape Reserve, Republic of Moldova

Victor SFECLĂ[1,2], Pavel PÎNZARU[2,3]

[1]Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences;
[2]Doctoral School of Natural Sciences, MSU;
[3]"Alexandru Ciubotaru" National Botanical Garden (Institute), MSU.
E-mail: victor.sfecla@spp.utm.md

The "Dobruşa" Landscape Reserve (2634.0 ha) is located on the hills of the Dniester Plateau in the Soldăneşti district. This area is mainly represented by mesophilous forests, and less by xeromesophilous and mesohygrophilic. Phytocenological research was carried out according to the methodology of the Central European School (Braun-Blanquet, 1964), where 26 floristic surveys were described. As a result of the recent phytocenological research conducted, it was found that on the territory of the „Dobruşa" Landscape Reserve, mesophilous forests of the *Carpinion betuli* Issler 1931 alliance predominate. The plant communities built by *Carpenus betulus* and *Carex pilosa* correspond to the association *Carici pilosae-Carpinetum betuli* Neuhäusl et Nehäuslová-Novotná 1964 [Syn.: *Querco petraeae-Carpinetum* sensu auct.; *Euonymo europaeae-Carpinetum* Chifu (1995), 1997; *Carici pilosae-Quercetum petraeae* Sanda et Popescu 1999]. This association is known in Central and South-Eastern Europe: Bosnia and Herzegovina, Czech Republic, Slovenia, Hungary, Romania, Ukraine, in the Republic of Moldova the phytocenoses of this association are recorded in the Central Moldovan Plateau. The described plant communities develop at an altitude of 174-350 m, on a plateau or on the upper part of slopes with various exposures, but with predominent northern ones (N, NE, NW), slightly inclined, 5-10, rarely 20-25°. They develop on gray forest soils, acidic, moderately acidic or weakly acidic, formed on sands. The arboreal layer, with a coverage of (70)85-95%, 18-25 m high, formed by the dominant species *Carpinus betulus* and *Quercus petraea*, mixed with *Acer campestre*, *A. platanoides*, *Cerasus avium*, *Fraxinus excelsior*, *Tilia cordata*. The shrub layer is absent or with a reduced coverage of 5-20(50)%, with sporadic vegetation of *Cornus sanguinea*, *Cratageus monogyna*, *Euonymus europaeus*, *E. verrucosus*, *Staphylea pinnata* and *Viburnum lantana*. The herbaceous layer is well developed, with a coverage of (50)70-95%, rich in species, but a high abundance is revealed only by *Carex pilosa*, or *Stellaria holostea*. In spring, *Anemonoides ranunculoides*, *Cardamine bulbifera*, *Corydalis cava*, *C. solida*, *Gagea lutea*, *Isopyrum thalictrides*, *Scilla bifolia* grow sporadically, and in summer sporadically or in small groups: *Asarum europaeum*, *Carex brevicollis*, *Euphorbia amygdaloides*, *Galium odoratum*, *Mercurialis perennis*, etc.
Characteristic species: *Carex pilosa*, *Carpinus betulus* and *Quercus petraea*.
Constant species: *Carex pilosa*, *Carpinus betulus*, *Quercus peraea*, *Tilia cordata*, *Acer platanoides*, *Anemonoides ranunculoides*, *Carex brevicollis*, *Corydalis cava*, *Corydalis solida*, *Fraxinus excelsior*, *Gagea lutea*, *Pulmonaria officinalis*, *Stellaria holostea*.
Among the rare species, the Red Book of the Republic of Moldova (2015) records: *Epipactis purpurata* (CR), *Fritillaria montana* (VU), *Galanthus nivalis* (VU) and a recently discovered species, which is recommended to be included in the 4th edition of the Red Book – *Epipactis leptochila*. Other rare species protected by the Protected Areas Law (1998) are: *Epipactis helleborine, Neottia nidus-avis*, *Platanthera bifolia*, *Scrophularia vernalis*, *Sorbus torminalis*, *Staphylea pinnata*, *Tulipa biebersteiniana* var. *biebersteiniana* and *Veratrum nigrum*.

Some aspects of stand structure and growth dynamics in a Black Pine (*Pinus nigra)* stand in the Zloți Forest District

Alexei JOSAN[1,2], Victor SFECLĂ[2]

[1]"Ștefan cel Mare" University of Suceava, Forest Biometrics Laboratory, Faculty of Forestry, Romania;
[2]Technical University of Moldova, Faculty of Agricultural, Forest and Environmental Sciences.
E-mail: alexei.josan1@student.usv.ro

Black pine (*Pinus nigra*) stands are confined mainly to Europe, with the most significant areas in Spain and Turkey. Subspecies also occur in Crimea and the Banat region. In the Republic of Moldova, black pine lies outside its natural range. It was introduced through afforestation beginning in the second half of the twentieth century, especially on degraded, eroded, or landslide-affected sites. Black pine has been used as an ornamental tree in parks and green spaces and for afforesting degraded lands near towns and villages, including steep, rugged slopes and degraded communal pastures. Black pine has a narrower climatic tolerance than Scots pine (*Pinus sylvestris*). It is adapted to warm, Mediterranean-type climates where late frosts are rare. Under such conditions, it is relatively undemanding, growing on heavy clay soils and on calcareous slopes exposed to strong sunlight and dryness. Within Moldova, the species occurs mainly in the south and partly in the central region and is less common in the north. In the Cimișlia Forest and Game Management Enterprise, black pine covers 118.75 ha with a total standing volume of 3,603 m^3; in the Zloți Forest District, the area under black pine is 12.47 ha. The study stand—located in management unit (compartment) 51C, Zloți Forest District—is a pure, even-aged, planted black pine stand, 50 years old according to the management plan. It covers 0.9 ha on a level plateau at 248 m above sea level. The soil is a typical clay-illuviated chernozem. We briefly present selected biometric results from a 30 × 30 m rectangular sample plot within this stand. In terms of horizontal structure, the stand is even-aged. Mean diameter at breast height (DBH) is 23.1 cm, and mean height is 16.1 m. The trees are in good health, and the stand is uniformly stocked.

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Growth and adaptive potential of *Pinus cembra* in a common garden experiment in the South-Eastern Carpathians

Mihai Bogdan FĂNĂȚAN, Elena CIOCÎRLAN, Alexandru Lucian CURTU

”Transilvania” University of Brașov, Faculty of Silviculture and Forest Engineering, Brașov, Romania.
E-mail: lucian.curtu@unitbv.ro

Pinus cembra (Swiss stone pine) occurs in scattered populations at high elevation sites throughout the Romanian Carpathians. It plays a key ecological role, being among the few tree species suitable for planting near the timberline in the Carpathian Mountains. In this study, we analysed adaptive and growth traits of *P. cembra* in a common garden experiment planted by dr. Ioan Balda (ICAS) in the Southeastern Carpathians (Azuga forest district, at an elevation of 1700 m), involving open-pollinated families grown outside its current distribution range. Measurements taken across 75 families and 4 replications revealed a high overall survival rate (81%) 22 years after planting, with a mean height of 4.2±0.3 m and an average basal diameter of 13±1.4 cm. Most individuals (86%) showed no signs of defoliation. Forking was observed primarily in the lower stem section (53% of trees), while 17% of individuals showed no forking. Half of the trees developed a straight stem, 38% showed minor curvature, and 11% had pronounced curvature. These findings support the suitability of *Pinus cembra* for high-elevation reforestation and conservation initiatives and underscore its potential for breeding and assisted migration programs in the Carpathian Mountains.