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Forest ecosystem management

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Downed Dead Wood. A Really Complex Carbon Stock

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Abstract: *Old-growth forests (OGF) are considered paramount for the local biodiversity, but recent studies have also highlighted them as globally important carbon (C) sinks. However, important knowledge gaps regarding OGF C pools and mechanisms of C sequestration are yet to be addressed.*

One of the main drivers of such C dynamics in forests is the dead Wood (WD) which comprises fallen dead trees, and remains of dead branches on the forest floor. This WD becomes paramount in OGF where it is calculated to accumulate the 20% of C in the whole ecosystem. With the aim of unravelling the intricated mesh of factors involved in forest respiration and hence, its mitigation capacity in the face of current and future global warming, we study in detail the WD CO_2 emission dynamics using a temperate European beech and silver fir forest in Sinca, Romania, one of the few old-growth forests remaining in Europe. Combining physical (density and CO_2 production) and chemical WD traits (nitrogen, C and full ionomics), our results show unexpected levels of interaction between species, diameter and wood traits, where, under a highly resilient ecosystem, the most well-known respiration drivers, such as temperature or humidity, fall to a second place. This research is an important step forward in the understanding of forest ecosystems, C budgets and mitigation potential and will provide accurate process-based predictions of the C sink capacity of OGF and a base-line for estimates of their vulnerability to climate change.

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Past Forest Management – An Important Driver for Forest Biodiversity

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Abstract: *At global level, large forest areas are heavily affected by human, their current characteristics being very different from those of natural forests and thus they show low resilience to disturbing factors. For this reason, clear action to return to natural state are currently considered, by excluding certain forests from human impact. The present study aims to analyse the set-aside impact on the current diversity of mountain temperate forests from the Natura 2000 site Rarău-Giumalău. Past forest management was described through the analysis of forest management plans drawn up for these forests after 1940. The current characteristics of the forest ecosystems were analysed based on information gathered in 2015 from a permanent inventory network that overlaps the entire site. We found that former management modifies forest functioning and, consequently, trees diversity. We observed that the behaviour of forest ecosystems after set aside greatly differs, depending on their characteristics at the time of exclusion from regular management.*

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Stationary and Non-Stationary Tree-Growth-Climate Relationships of Silver Fir, Black Pine and Scots Pine Trees Growing in the Romanian Carpathians

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Abstract: *Along the lifetime of the trees, tree-growth-climate relationships are assumed to have a stationary character, i.e. continuous or time-independent, while the fact that these relationships are more likely to have a non-stationary character, i.e. discontinuous or time-variable, has been mostly neglected in dendrochronology. In this study, we used nine residual ring-width index chronologies (RWIresidual) of silver fir, black pine and Scots pine trees and different precipitation- and temperature-derived seasonal climatic variables to run heat map analyses based on rolling window correlations using corrected p-values in order to deal with the type I errors and reduce them. Our purpose was to evaluate the evolution and stability of tree-growth-climate relationships, i.e. their stationary or non-stationary character, along the lifetime of the trees. Our results showed that, along their lifetime, the Abies trees had stationary tree-growth-climate relationships with the winter temperature while the Pinus trees had stationary tree-growth-climate relationships with the spring-summer precipitation of the current-to-growth year. Instead, the non-stationary tree-growth-climate relationships were species- and site-dependent and stopped at some point in time, this decoupling being linked in many cases with climatic anomalies. Our study highlights the importance of looking at the stationary or non-stationary character of the tree-growth-climate relationships if we want to better understand the future of our forests based on past tree-growth-climate relationships. Heat map analyses based on rolling window correlations are a powerful statistical tool in this regard.*

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Integrating Masting Observations for the Main Tree Species in Romania in Time Series

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Abstract: *Masting represents a reproductive strategy of plants, characterized by the synchronous production of large seed crops, generally with a specific frequency. This synchronous behaviour can spread on a large scale for a species and induce cascading effects on population dynamics and forest properties, with practical importance for foresters.*

Knowing or predicting masting events can provide information of great importance for silvicultural treatments and regeneration cuttings which should be synchronized with the masting years.

In the context of the studies carried out at the international level, constructing the masting chronology for the main forest tree species in Romania is also needed. Even if records of masting were used in the past by forest management, this information is no longer used or archived in Romania.

This work presents a data collection initiative detailing the structure of this information and the first results collected for the main forest tree species (Norway spruce, silver fir, beech, oak and sessile oak) with geographical location data of the observations.

This initiative's goal is to stimulate interest in masting events by creating a functional technical platform that can integrate citizen-science observations. Such data can be used to develop masting chronologies for tree species, which is useful for researchers and forest managers. Furthermore, the information might be a valuable tool for developing models and predicting tree species dynamics in the context of climate change.

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Do Different Tree Ring Parameters Contain Different Climate Signals? A Case Study of Norway Spruce in the Eastern Carpathians

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Abstract: *The tree rings are one of past climate variations most important proxy archives. The tree ring width (TRW) is one of the most used parameters in dendroclimatology. Other parameters, such as basal area increment (BAI) or blue intensity (BI), could offer more information about climate – tree relationship. In this paper, it was analyzed how the correlation between air temperature and growth of Norway spruce differs with altitude using three tree ring parameters. The study area, the Gheorgheni region, Romania (Eastern Carpathians), has a mountain climate with frequent thermal inversion in winter. The climate-growth relationship was analysed for two tree ring datasets (low elevation – below 1000 m a.s.l. and high elevation – above 1500 m a.s.l.). Two local weather stations provided daily temperatures (Joseni – 750 m a.s.l. and Bucin – 1282 m a.s.l.). The bootstrap Pearson correlation between cumulative daily temperature data and 3 parametres (tree ring width - TRW, basal area increment – BAI and blue intensity - BI) was computed for each series. The results show that elevation changed the climate response pattern in the case of BI, and remains relatively similar for TRW and BAI. The highest values for correlation coefficient (r = 0.541 to 0.551) were recorded between BI residual index from high elevation series and summer/autumn temperature from Bucin for cumulative windows of 51 – 59 days (second decade of August to the beginning of October). Our preliminary results show that different tree ring parameters capture different climate signals.*

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The Influence of the Ethanol in Synthetic Lures for *Ips duplicatus* - Experimental Design and Preliminary Results

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Abstract: *Ips duplicatus (Sahlberg) (Coleoptera, Curculionidae) is currently one of the most important invasive species of bark beetles in Central Europe, contributing to the drying out of spruce forests located in premontane and hilly areas. The monitoring of this species is an important concern of forest managers, this activity being mainly carried out by the help of intercept traps baited with synthetic lures. The currently used lures mainly contain the specific pheromonal compounds for Ips duplicatus (ipsdienol and e-myrcenol) and in very small proportions kairomonal compounds (alpha pinene and limonene). , However, debilitated spruce trees also release significant amounts of ethanol. In this context, the purpose of this research is to analyze how the response of Ips duplicatus to the synthetic lures can be influenced by the addition of ethanol.*

Thus, five variants of mixtures of volatile substances were made in which the amount of ethanol varied. The obtained volatile mixtures were introduced into standard dispensers made of polyethylene foil and felt, the surface of the foil being calculated to lead to a release rate of 25-30 mg/day (20°C).

Testing the response of Ips duplicatus beetles was done in 3 locations in Romania and the Czech Republic where there are stands affected by the attack of this bark beetle (Todirești - Suceava, Râșnov - Brașov and Libava - Czech Republic). 15 wing-type traps were installed in each location (3 experimental blocks x 5 experimental variants). The collecting of the captured insects was done weekly at which point each experimental variant was moved by one position within the experimental block, so that after the first 5 collections, a complete rotation was achieved within a block.

After analyzing the first catches, it was found that all tested variants attracted ID beetles and other species of bark and wood beetles, or predatory insects of bark beetles were also captured.

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Population Differentiation in *Acer platanoides* L. at the Regional Scale - Laying the Basis for Effective Conservation of Its Genetic Resources in Austria

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Abstract: *Norway maple (Acer platanoides L.) is a widespread forest tree species in Central and Northern Europe but with a scattered distribution. In the debate on climate change driven changes in species selection in the forest, Norway maple has recently received raised interest because of its comparatively high drought resistance. Therefore, it is an interesting species for sites high in carbonates and where other native tree species have become devastated by pathogens. In Austria, the demand on saplings is currently rising, while there is only very little domestic reproductive material available. This study was undertaken to identify genetic diversity and population structure of Norway maple in Austria to lay the foundation for the establishment of respective in situ and ex situ conservation measures. In addition, samples from planted stands and imported reproductive material from other countries were included to study the anthropogenic influence on the species in managed forests. We used 11 novel microsatellites to genotype 756 samples from 27 putatively natural Austrian populations, and 186 samples derived from two planted stands and five lots of forest reproductive material; in addition, 106 samples from other European populations were also genotyped. Cross species amplification of the new markers was tested in 19 Acer species from around the world. Population clustering by STRUCTURE analysis revealed a distinct pattern of population structure in Austria, but overall moderate differentiation. Sibship analysis identifies several populations with severe founding effects, highlighting the need for proper selection of seed sources of sufficient genetic diversity in the species.*

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Analysis of Genome-Wide Abiotic Genetic Adaptation in European Beech

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Abstract: *Climate change led to a widespread growth decline of European beech and a further growth decline as well as potentially increasing tree mortality is predicted for the future. Therefore, knowledge of the genetic basis of environmental adaptation of this species is of particular importance. We conducted a genome-wide association analysis in German beech populations growing under different environmental conditions. Genotyping by sequencing revealed 13,493 high-quality Single Nucleotide Polymorphisms (SNPs), which were used for association analyses. In total, 38 SNPs were consistently identified by different methods to be associated with environmental and/or tree physiological variables. Several of these SNPs were located in intergenic or intronic regions of the genome suggesting a potential role in gene regulation. The identified SNPs as well as additional potentially adaptive and neutral SNPs will be used to genotype 2000 individuals of a provenance trial, which is replicated at two different sites in Germany. At these two sites, the traits diameter at breast height (dbh), height growth, bud burst timing, autumn leaf coloration, specific leaf area, and stomata density are recorded and used for SNP-phenotype association analyses. These analyses will help to determine the relative importance of genetic and environmental effects on trait expression.*

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The Role of Forests and Pastures in Combating the Economic Vulnerability of Rural foRest Communities during the Corona Outbreak

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Abstract: *The prevalence of Corona disease as one of the most critical infectious diseases has increased the risks of food security in different parts of the world. Local communities, especially in rural areas, are highly dependent on natural resource-based ecosystem service strategies to manage global food security and meet livelihood needs. Forests and pastures can also provide goods and services that are sold or consumed directly as part of natural resources. Identifying livelihood patterns can suggest several potential strategies for maintaining a livelihood in the face of sudden shocks such as corona. The main purpose of this study is to focus on identifying the dependency of rural communities to forests and rangelands during the corona outbreak and how to deal with and adapt to the economic damage of this disease through ecosystembased services. The research method of this research is descriptive survey and data will be collected through field studies using a questionnaire. To complete the questionnaire, first the villages will be selected by pre-study and randomly. The results showed that livestock (67%) and agriculture (67%) were the main activities of local respondents. The average annual household income of the studied households was 1023 million Rials during the COVID-19 crisis. The average income diversity index for all sample households was 1.09.*

Income of local communities from forests and pastures were mostly from medicinal plants, fruits, fodder and mushrooms. The share offorests and pastures in the total household income of all interviewees was 1.43% and 2.84%, respectively. According to the results, 77.6% of respondents stated that they use natural resources including forests (63%) and pastures (67%). Forage collection (44.6%), medicinal plants (42.2%) and forest fruits (29.3%) were the three most important forest products that were mentioned among local respondents in Arasbaran forests. Given the global nature of the Corona crisis, identifying ecosystem-based strategies, especially forests and pastures, can inform rural communities in other parts of the country and the world. This study helps managers and planners assess the vulnerability of local communities and identify ways out of the crisis.

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Multi-Trait Selection in Aegean Region Low Breeding Zone for *Pinus brutia* Ten.

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Asbtract: *Multi-trait selection is crucial for tree breeding. Turkish red pine (Pinus brutia Ten.), carried out breeding in five breeding zones, is economically the most important species in Türkiye. In the low elevation (0-400 m) breeding zone of the Aegean Region of Turkish red pine, open pollination seeds were collected from the plus trees in 8 populations (five seed stands and three gene conservation forests). Three progeny tests (Marmaris-Hisarönü, İzmir-İzmir, and Bergama-Kınık) were established with 168 families and six control. However, a totally of 188 families have consisted in the three tests. All the tests consisted of randomized complete blocks design with the four-tree-row plot. At the end of the fourth field age, height, terminal shoot length, and the number of flush in the terminal shoot were measured. After estimating genetic parameters, genetic gains were estimated for all traits using the index selection. Economic weight for traits was determined by contributing to growth in seedlings. Individual heritabilities for height, terminal shoot length, and the number of the flush were 0.16, 0.11, and 0.08, respectively. Genetic gains were estimated as 16%, 11%, and 4%, in the same order for traits, in case the best 20 families were selected using the index selection.*

Keywords: *Turkish red pine, heritability, economic weight, index selection.*

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Genetic Diversity of Siberian Scots Pine (*Pinus sylvestris* L.) Populations

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Abstract: *Scots pine (Pinus sylvestris L.) is one of the main forest-forming tree species in Siberia, which has been intensively exploited for many decades. In order to manage the genetic resources of Scots pine efficiently, knowledge on genetic diversity and population structure is needed. In this study, we assessed the genetic diversity of nine natural Scots pine populations using ten chloroplast simple sequence repeat (SSR) markers. A total of 42 alleles were detected across 90 individuals, and a moderate level of genetic diversity was revealed (h = 0.409). Analysis of molecular variance (AMOVA) showed that 4% of the variation occurred among populations and a significant amount (96%, p < 0.01) of the total variation occurred within populations. STRUCTURE analysis revealed two genetic clusters with no significant geographic population structure. However, the Mantel test showed significant correlation between genetic distance and geographic distance (R2 = 0.42, p = 0.01). These results may indicate that efficient long distance gene flow exists among the Siberian Scots pine populations. Our research is of great significance in monitoring of the state of forest genetic resources in Siberia.*

Funding: *The research was carried out within the State Assignment (theme «Fundamental principles of forest protection from entomo- and phyto- pests in Siberia» No. FEFE 2020-0014) supported by the Ministry of Education and Science of the Russian Federation.*

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Climate Change Effects and Corresponding Measures for Mitigation and Adaptation to Climate Change in the Southern Julian Alps – A Case Study

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Abstract: *Natural disturbances severely impact the development of forests in Slovenia. To identify the main disturbance agents in the pilot area (Southern Julian Alps) we analysed past trends and structure of annual timber harvest in the period 1995-2020. To identify the main stand and environmental factors that affect the frequency and severity of disturbance, we analysed 26 windthrows and 26 bark beetle outbreaks. Using bivariate analysis and binary logistic regression, we also compared both samples with control stands of the same stand and site characteristics. In the last decades, the main disturbance agents were windthrow and bark beetle outbreaks. Windthrow occurred more frequently in stands on southern-exposed slopes with undulating terrain (steep to moderate ridgelines) and a high level of stoniness, high growing stock and either dense or partly-opened canopy cover. Windthrows occurred mainly as a result of the strong south-western winds. Bark beetle outbreaks occurred mostly on sites with south-eastern exposure, undulating terrain, in mature stands with high growing stock and a greater share of conifers, high proportion of regeneration or stands under regeneration and a lower proportion of pole stands. We proposed a set of measures that would contribute to optimized mitigation and adaptation to climate change. These measures include implementation of forest management planning guidelines that Slovenia Forest Service has prepared in projects Forests for Future and LIFE Systemic. The proposed measures cover forest regeneration, tending, protective measures, technical and infrastructural guidelines, and measures related to the education and cooperation of key stakeholders in the forestry sector.*

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Potentiality of Payment for Ecosystem Services (Pes) in Community Forest: Linking Upstream and Downstream Households

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Abstract: *The current study was carried out in Nawalpur Saraswati-Basamadi Community Forest in Makawanpur district to assess the potentiality for implementing PES mechanism. This study employed both qualitative and quantitative approaches. Households survey (n=142), key informant interview and focus group discussions were carried out to identify major environmental service and discuss the possibility of creating an institutional mechanism for PES. Discrete choice experiment method was used to determine the preferences of both upstream and downstream communities for forest conservation. The study found provisioning, regulatory and cultural services (including forest products, pure and clean drinking water, tourism and recreation etc.) are the major ecosystem services provided by NSBCF and forest products; and pure and clean drinking water being the most important ecosystem services. Community forest was reported as most preferred institution to follow the PES mechanism and indirect payment mechanism got the highest preference among the respondents. Majority of people from both the upstream and downstream community around NSBCF has positive response for WTP and WTA for ecosystem services. They have strong willingness to pay (WTP) of NRS. 187.70 per year/HH and willingness to accept (WTA) of NRS 295.10 per year/HH for the conservation of forest. This indicates that both the upstream and downstream communities are willing to conserve the forest and implement the PES mechanism as sustainable conservation approach. Therefore, this study recommends that there are adequate existing institutions at the local level that could play vital role in implementing PES mechanisms.*

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Foliar Nutrition Status of Main Forest Species in Romania

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Abstract: *Dynamics of the forests health has generated widespread concern in the past decades. Following the first report on the health of forests in Europe, released in the late 70's, one of the factors directly and indirectly held responsible for the condition of forests was industrial pollution thus, emerged the need to harmonize specific research monitoring programs extended to European and global level. Monitoring forest health in Romania started in 1990 and was carried out in permanent sampling plots. Among studied variables (e.g. biometric, defoliation, soil properties) foliar nutrients content highlights qualitative and quantitative used ultimately in assessing the health of trees and offers reliable parameters to determine the general state of the ecosystems. Nutritional status of trees was characterized by the type of nutrition, determined in relation to the content of the absolute foliar mineral element (per unit of dry biomass) and cationic reports between nutrient contents that can reflect potential imbalances. Determination of nutrients contents was achieved by oxidation of the organic matter and solubilization of the residue. Overall, the levels of foliar nutrition for spruce are normal, the beech on the other hand showing a deficit in the supply of nitrogen and potassium, but offset by an adequate supply of calcium and phosphorus, which in turn leads to a balanced nutrition.*

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Invasive Behaviour of Oak Lace Bug, an Alien Insect Species, in Romanian Oak Forests

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Abstract: *Given the globalization phenomenon, which is considered increasingly intense in recent decades, alien species have produced biological invasions that have resulted in multiple negative effects on the economy, human health, but especially on the environment. One of the alien species that has invaded Europe relatively quickly is an insect species of North American origin, Corythucha arcuata (Say, 1832) (Heteroptera, Tingidae), commonly known as the oak lace bug. This research aimed to study the oak lace bug's invasive behaviour in Romanian oak forests to substantiate the protection measures that will be prescribed. To achieve this goal, the evolution of the damage caused during 2017-2020 was tracked. The results showed that the insect invaded all oaks ecosystem (mesophilous and termophilous sessile oak forests, mesophilous pedunculate oak forests, termophilous Turkey oak and Hungarian oak forests and termophilous grayish oak and downy oak forests). Strong attacks were recorded in the pedunculate oak, Turkey oak and Hungarian oak forests, while in the sessile oak, grayish oak and downy oak forests the attack intensity was relatively weak.*

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Estimating Forest Fuel Biomass of Iranian Northern Zagros Forests

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Abstract: *Behavior, extent, and intensity of forest fires are highly dependent on the type and volume of fuels and their spatial variability in a natural area. Assessing the volume of fuels in different forest canopies is very important for crisis management and the prevention of possible fires. The purpose of this study is to determine the amount and type of fuels of Iranian Northern Zagros forests in Sardasht County in different forest densities. Therefore, according to the statistics of recent fires in Sardasht, the study areas (Nalas and Shiyomereh) were selected based on the percentage of vegetation (Open, relatively dense, and dense). In this study, one square meter samples were used to measure the properties of fuels such as average vegetation height, 1-, 10-, and 100-hr timelag fuels, total fuel volume, and litter volume and depth. The results showed that the total fuel volume in the studied forest areas is 3.9 kg/m^2. Also, the maximum 1-hr fuel volume was calculated in dense forest (Shiyomereh). The highest fuel volumes of 10-, and 100-hr timelag fuels were observed in forest areas with relatively dense canopy (Shiyomereh). The calculation of the fuel moisture content percentage (FMC%) also showed that forest areas with dense canopy have the highest amount of FMC% among forest lands with relatively dense (Shiyomereh) and open (Nalas) canopy. The results of this study can be used in firefighting, crisis management and in many studies related to the study of fire behavior and protection and management of forest areas.*

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The Spatial Heterogeneity and Recent Evolution of the Gaps in the Largest Beech Virgin Forest of South-Eastern Europe - The Nera Forest Reserve

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Abstract: *The very numerous studies on gaps structure, evolution, and role in the forest dynamics have revealed interesting conclusions and models for forestry practice, but the variety of natural conditions and the existing small area of virgin forest in Europe is a challenge in implementing various research results in practice. The role of forest gaps in the virgin beech forest dynamics is largely recognized but the gap distribution, size, complex structure, and longtime spatial evolution in very large natural forest areas are not very much studied although they could provide valuable information for establishing models to be applied in the future adaptive strategies to sustainable forestry management. The study area is very significant and important for forest science: the largest virgin beech forest in the EU, recently included in the UNESCO list. The scope of the present paper is to contribute to the description of the recent forest gaps evolution and their potential relation with natural regeneration and general stand development in the beech natural forests, using satellite imagery. The forest gap characteristics in 10 circular representative plots of 1 ha each in the period 1968 – 2018 and their spatial distribution and structure were analyzed using satellite imagery and recent direct measurements in the field. The broad structural variety and complex dynamics of Izvoarele Nerei virgin beech forest show the extent of diversity a monospecific but natural forest could reach.*

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Ecosystem Services Generated by Young Plantation Forests Established on Degraded Lands in Drought Prone Areas from South-Eastern Romania

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Abstract: *Romania has started in the year 2002 a pioneering project of afforesting degraded agricultural land for the purpose of trading CO_2 emissions reductions resulting from the 15-year storage of CO_2 in forest ecosystem pools (biomass, necromass and soil). Within the project an area of approx. 6,000 ha of degraded lands were afforested spanning across 7 counties in southern and eastern Romania with small forest areas and affected by the desertification phenomena (e.g. prolonged drought, high average temperatures, "flying sands"). The main species used for afforestation were indigenous oak, poplars and willow species, a number of auxiliary species as well as black locust, but only in situations where the stand conditions did not allow the use of indigenous species. Based on the latest project monitoring results the identified ecosystem services include air quality improvement by storing cca. 400000 tCO_2 in carbon pools, remediation of land degradation by stopping sand deflation approx. 2000 ha and biodiversity improvement by offering shelter to numerous bird and mammal species that have been identified within the project boundaries. Local communities' lives were improved one hand by the access to a renewable source of energy (wood harvested from tending operations) and on the other by benefitting new revenues from working in the afforestation activities or by being paid for the value of the emission reductions in the case of private owners of plantations included in the project.*

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Ecological Reconstruction of Stands Affected by Harmful Abiotic Factors

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Abstract: *The damages caused to the forests or forestry lands, caused by the climatic changes (manifested by extreme weather phenomena) or pollution, impose extensive actions of their ecological reconstruction. Among the most common causes are: wind and/or snow, freezing rain, drought and / or changing environmental conditions (meadow stands, softwoods outside the habitat and so on), landslides, affecting both the forest and the land whose conditions are changing substantially, pollution. Such phenomena represent a major threat adressed to the environment, with negative economic effects. All these lead to the degradation of the forest ecosystem with the most dangerous consequences (land degradation, loss of forest regeneration capacity, reduction of biological diversity, etc.).*

The present paper refers to the results regarding on analysis of the environmental conditions of the degraded ecosystems, highlighting their substantial modification, which requires the performance of special and expensive works in order to achieve ecological reconstruction the damaged trees. The analyzed situations were those of trees damaged by ruptures/fellings (caused by wind and freezing rain, landslides), drying due to drought, low groundwater level and / or soil trophicity, pollution with oil residues, etc. Depending on the environmental conditions, forestry works have been established for landscaping / consolidation, soil preparation and / or pedo-amelioration as well as afforestation compositions with species corresponding to the new conditions, different from those of the affected stands.

The results were obtained from studies conducted in the period 2016-2022 in stands affected by various harmful abiotic factors.

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Concentration of Heavy Metals in Annual Rings of Coniferous Trees Affected by Local Industrial Pollution

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Abstract: *Air pollution is an increasingly discussed topic in recent years, especially in urban areas, where a number of pollutants, including heavy metals, are released into the atmosphere from various sources, and can have adverse effects on both wildlife and forest ecosystems. Heavy metals are long-term pollutants and forest vegetation is able to accumulating these elements but without a natural removal mechanism. This study provides an analysis of heavy metals accumulated in growth rings over 60 years. Two tree species, Norway spruce (Picea abies L.) and Silver fir (Abies alba L.), from the Tarnița region (Suceava) in northern Romania, which has been intensively polluted by mining, extraction and processing of non-ferrous metals, were studied. The sampling design was carried out systematically to capture different degrees of pollution (intensively polluted and unpolluted). The main chemical elements identified in the chemical composition of the growth rings are copper (Cu), manganese (Mn), iron (Fe) and zinc (Zn). Higher concentrations of these elements were identified in trees in the intensively polluted area, especially for Mn and Fe. And in the case of elements where no significant differences were found between intensively polluted and unpolluted areas, it can be said that the elements analyzed are vital for the development of forest vegetation and have not accumulated in high quantities that could cause negative effects or become toxic.*

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Chemical Eliminating of Weeds Prior to Reforestation of Oak Forests

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Abstract: *Weeds have the highest negative influence in regeneration of oak forests, especially perennial broadleaf weeds, thus the objective of this study was to examine the possibility of applying chemical measures for weeds control. During 2020-2021, experiments were set up in the oak forest in Vojvodina, Serbia. The experiment was arranged as a randomized block design with four replicates and each experimental subplot was 10×5 m in size. The herbicides used were applied in two rates: glyphosate at 2.88 and 4.32 kg a.i. ha^{-1}; fluroxypyr at 0.37 and 0.50 kg a.i. ha^{-1} and halauxifen-methyl at rates of 0.002 and 0.003 kg a.i. ha^{-1}. Applications were performed with an air-pressurized hand-sprayer, with a boom fitted with one nozzle, calibrated to deliver 300 L ha^{-1} of water at 250 kPa pressure. Herbicide efficacy was rated visually 15, 30, 45 and 60 days after herbicide application where 0% meant no efficacy and 100% meant full weed control. Results indicated that weeds had good tolerance to halauxifen-methyl as both applied rates were not effective. Neither rate provided a level of control that could be deemed satisfactory. Fluroxypyr applied at rate 0.50 kg a.i. ha^{-1} generally was more effective than 0.37 kg a.i. ha^{-1}. Glyphosate provided 100% control of weeds in both applied rates. This study showed that broadleaf weeds can be effectively managed with glyphosate and fluroxypyr and that applying lower rate of 2.88 kg a.i. ha^{-1} glyphosate and higher rate 0.50 kg a.i. ha^{-1} fluroxypir can achieve excellent efficacy.*

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Cigarette Butt as a Carbon Source and Its Potential Application in the Preservation of Environmental Protection

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Abstract: *Cigarette butts (CBs) are the most common type of litter on earth, with an estimated 5.5 trillion discarded annually. Apart from being unsightly, CBs pose a serious threat to living organisms and ecosystem health when discarded in the environment because they are toxic to microbes, insects, fish and mammals. In spite of the CB toxic hazard, no studies have addressed the effects of environmental conditions on CB decomposition rate. Numerous proposals have been made to prevent or mitigate cigarette butt pollution, but none has been effective; unsurprisingly, several studies have reported that CBs are the most common item retrieved by clean-up activities in public areas such as beaches and parks. The aim of this study was to collect a certain quantity of CBs, to examine the raw CB, their composition and properties, and then translate them into carbon material as a source of carbon, and as such material also examine the properties and its potential application, and therefore contribute to the preservation of the environment. Physicochemical properties of raw and carbonized CBs were studied by using element analysis, XRD (x-ray diffraction), Fourier-transform infrared (FTIR) spectroscopy, Field emission scanning electron microscopy (SEM), X-ray fluorescence (XRF) analysis.*

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Study on the Foliar Pests of Three Sprecies of Trees from Alignments of Floreşti Park

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Abstract: *Floreşti Park, designed by the landscape architect Karl Friedrich Wilhelm Meyer, is one of the oldest and most complex Western-inspired parks in Romania. Even if some conservation and restoration actions have been carried out recently at the level of the lake and the adduction canals and even the alignments of the entire area have been redesigned, the advanced ages of the trees make them sensitive to the action of pests and pathogens. Keeping as many trees as possible from those originally planted implies maintaining a proper state of health. The first step towards ensuring the health of the trees is to know the potential pests of the trees and their impact on the state of vegetation. This identification of the spectrum of pests will then serve to find solutions that are as friendly as possible to the environment and that allow the conservation of the old trees. This study aims to evaluate, qualitatively and quantitatively, the effect of the attack of foliar pests on three of the tree species from the most important alignments within the park. Sample branches will be collected from each cardinal direction, from the base of the crown, from ten trees of each host species. The first five leaves from each sample branch will be analyzed. Pest species will be identified mainly by the appearance of the attack, which in most cases is characteristic. Afterwards, the leaves will be pressed, scanned and the quantitative assessment of the injuries will be done using the WinFOLIA program. In this way, we will get a more accurate evaluation of the impact that foliar pests have on the trees in the park.*

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Assessment of Heavy Metal Pollution using the Monumental Trees Leaves

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Abstract: *In urban environments one of the considerable problems is the atmospheric pollution and the most significant source of air pollution come from anthropogenic sources such as energy production, combustion of fossil fuels in motor vehicle traffic and industry.*

The aim of this study was to present the results of some research of heavy metal concentrations (Pb, Cd, Mn, Fe, Cu, Zn) in the leaves of the monumental trees (evergreen coniferous and deciduous) carried out in the nine counties inside the Carpathian arch.

The location of the monumental trees from where the leaf samples were taken is inside the Carpathian arch from Romania. The leaves samples of the 37 specimens were collected in the summer season from twelve sites.

Analyses of heavy metal contents in the leaves of the monumental trees demonstrates a correspondence with the low level of atmospheric pollution. It is remarkable that among the six heavy metals that were analyze, only four presented high amounts of accumulation in the leaves samples and have exceeded the toxicity threshold. From the nine counties where leaf samples were taken, only in two of them is a slight pollution with heavy metals, in Maramureș County with Zn and cadmium and in Cluj county, where the iron, Zn, cadmium and copper concentration from leaf samples exceed the toxicity threshold.

Those monumental trees can be also used for environment restoration and they can promote a sustainable urban development to decrease pollution, to obtain a healthier urban environment.

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Fruit-Providing Species in Locally-Led Climate Change Adaptation Strategies in Arasbaran Forests, Iran

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Abstract: *Fruit providing species increase motivation of local people for planting these species at the farmlands at the agroforestry systems. It helps for improving the rural household economy and increasing wood lands. Recently, some efforts were being made to combat land degrardation in arid lands of Iran with expanding fruit providing species in arid lands. Forest organization of Iran has expanded sumach (Rhus coriaria L.) plantation by local people in high sloppy and degraded lands. With the increasing awareness of their economic potential and growing concerns for the land degradation, rural communities have been encouraged to expanding of sumach woodlands in a part of Arasbaran biosphere reserve. This research was done in Hurand where is located in Northwest of Iran with annual average rainfall about 290 mm. We will focus on the benefits of planting trees for combat with land degradation. Also, we will compare the soil nutrient and financial returns for silvo-pastoral and agricultural systems. Soil samples will be analyzed in the soil lab and economic analysis will be done by data collected by filed works from rural households who are involved in two systems so that we can compare them easily. We expect that net present value of silvo-pastoral systems was higher than agricultural systems. Also we will expect that soil nutrient value in silvo-pastoral systems have better situation than agricultural systems. Afforestation and inverse conversion has occurred from croplands into woodlands due to higher revenue of sumach especially in high slope lands. Woodlands would be an important factor that resulted in less soil erosion. It can be concluded that conversion of farmlands into agroforestry systems will lead to sustainable economic and ecological benefits.*

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Contributions to Flora and Vegetation of Piatra Craiului National Park (I)

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Abstract: *This article, the first from a serie dedicated to the study of some endemic and with high conservation value habitats from Piatra Craiului National Park, presents the results of some phytocoenological survey, realized at 1700 - 2070 m altitude, in coenoses of Seslerio haynaldianae - Caricetum sempervirentis Puşcaru et al. 1956 ass., hosting the local and obviously symbolic endemic species from this IUCN, II category, protected area - Dianthus callizonus. The survey highlights the presence of other allmost 20 species important for biodiversity conservation and the paper emphasize also some new identified taxons for Piatra Craiului Mountain, or some new sites for important, rare or sporadic species, in relation especially to the last monographic work of synthesis for this massif (Mihailescu Simona 2001).*

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Plant Species Diversity in Relation with Forest Management of Beech-Conifer Forests in Postavaru Mts. (Carpathians Mts., Romania)

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Abstract: *In the last decades there is a high pressure from public society to extend the strictly protected areas in order to preserve biodiversity. The social and economic impacts of such demands are usually neglected. Without scientific proofs, the traditional forest management is seen sometimes as the main threat to forests diversity. In such context, the aim of this study is to document the changes on plant species composition along a gradient of silvicultural disturbances. Seven disturbance classes were identified on the southern slope of Postavaru Mts., including a strictly protected old-growth forest. In each class three permanent plots were surveyed. Plots and classes were compared through several indices of alpha and beta diversity. The results indicate the youngest and highly disturbed forest as the most diverse, both in term of overall composition and forest species. Even more, sensitive species (as orchids) or some functional species groups (as pollen-, nectar- or fruit/seed providers) thrive also in younger classes. As already found in other parts of the world, species diversity is rather an indicator of disturbance than of conservation status. It can be concluded that a forest with a mosaic of all development stages could be richer in species than a continuous old-growth forest. Without neglecting the role of pristine forests, it has to be accepted that a proper forest management is a tool to preserve biodiversity.*

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Study on the Diversity of Beetles Captured in Unbaited Intercept Traps in Codrul Secular Șinca, Brașov County, Romania

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Abstract: *Saproxylic insects, together with various species of fungi, bacteria, and other invertebrates, play a vital role in the natural recycling of dead wood by decomposing dead wood biomass. The association between the rate of decomposition of dead wood from different tree species and the spectrum (diversity) of saproxylic insects has been little studied. The main purpose of this paper is to emphasize the diversity of beetles in Codrul Secular Șinca by undergoing a comparative analysis of two areas with different management: the virgin forest and the adjacent buffer zone. The following objectives have been established in order to achieve the proposed goal: i) identification of the beetle spectrum collected in both the virgin and managed forests; ii) a comparative analysis of the species and families spectrum in the studied areas with particular emphasis on the saproxylic species.*

At the end of May 2021, 15 circular plot areas were established in the study area's non-intervention zone, as well as another 20 plot areas in the buffer zone, with each plot measuring 500 m^2. We used the WitaPrall Ecco traps with transparent panels, placed 1 meter above the ground from the collecting pot, and were anchored using raffia strings from nearby trees. The traps were not primed with attractants, and in order to preserve the captured material, each collecting pot included an equal proportion of ethylene glycol and water (about 200 ml). The insects were collected at two-week intervals between 17.06.2021 and 24.09.2021.

During the collecting period, 1933 individuals were captured in both areas, comprising 132 species belonging to 40 families, namely: in the virgin forest, 1371 individuals representing 95 different species were collected, whereas in the managed forest, 562 individuals from 99 different species were collected. Orchestes fagi, Agriotes acuminatus, Salpingus ruficollis, and Serropalpus barbatus were the most abundant in both areas, totaling together 874 individuals, or 45% of the total catch. Moreover, the preponderance of the species collected pertains to the families Elateridae, Staphylinidae, and Curculionidae. The saproxylic characteristic of these species' majority is a remarkable trait to note. In this regard, we concluded that 89 beetle species, or around 68 percent of the species richness, belong to this niche. Furthermore, we emphasize the existence of 66 such species in the virgin forest out of 95 and 62 saproxylic species in the managed forest out of 99.

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Influence of Herbicides Application on CO_2 Emission from Soil during the Regeneration of Pedunculate Oak Stand

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Abstract: *Some types of pesticide intensify CO_2 emission from soil, whereas others decrease or do not have any influence. Due to the rapid growth of weeds which can have a negative effect on seedlings, the successful regeneration of pedunculate oak (Quercus robur L.) stand requires an application of herbicides. The aim of this study was to examine whether the influence of herbicides during the regeneration of oak stand can induce an increase of CO_2 emission from soil. On the regeneration area of oak stand, the two sites were chosen for research. The treatment of herbicides was conducted on the first plot, while the second plot was without herbicides application. Both sites were situated on the same type of soil. The samples of gas were collected by respiratory chambers. The bases of chambers were installed to the soil depth of 5 cm. Before sampling, the chambers were attached on the top of the base, in hermetic condition. The analyses of collected samples were performed on the gas chromatograph. On the first plot, which was under treatment of herbicides, CO_2 emission was considerably greater compared to the second plot. Soil moisture was key driver of emission at both plots. The increase of soil moisture was followed by the rise of CO_2 emission. However, the greatest differences in emissions among plots were recorded when soil moisture reached the maximum value. During the regeneration of oak stands, herbicides had stimulating effect on CO_2 emission from soil.*

Keywords: *CO_2, herbicides, Quercus robur L., soil moisture.*

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Historical Changes of the Quantitative and Qualitative Characteristics of Tbilisi City Forest under Climate Change Conditions

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Abstract: *Tbilisi city forest is the only urban forest in the South Caucasus region (located around the capital city) that, on one hand, has a special protective and recreational function, and, on the other hand, suffers from negative anthropogenic impact, which is exacerbated by the situation caused by global climate change.*

Here we present the result of the study, which was a part of a scientific project "Climate change impact modeling on urban forest ecosystems of Tbilisi Municipality (model PICUS v1.5)". The assessment of the historical changes, of the main quantitative and qualitative characteristics of Tbilisi forest was carried out for the last 55 years, based on the forest inventory data for the following years: 1964, 1874, 1984, and 2018. Climate data of the relevant periods and current field study data are also used.
Within the framework of the study, the following main characteristics in dynamics were assessed:

- *Changes of forest area, including the forest formations (coniferous & deciduous), age, structure, and origin (artificial & natural);*
- *Changes of volume, including both total volume as well as average volume and increment per ha. Also, include volume by forest formations (coniferous &deciduous);*
- *Changes in the Biomass and Carbon Sequestration;*
- *Changes in the stand quality class ("bonitat").*

Our study results reveal that the forest maintains its productivity, even though the negative impact of anthropogenic and climate change on its particular quantitative and qualitative characteristics is noticeable.

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The Cleridae (Insecta: Coleoptera) from the "Friedrich Deubel" Entomological Collection of the Faculty of Silviculture and forest engineering, Transilvania University of Brasov

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Abstract: *The entomological collections represent both historical milestones - in order to preserve the knowledge of the past biodiversity - and useful tools - which help the further development of the science and of the environment protection. In this work, the Cleridae material conserved in the "Friedrich Deubel" entomological collection from the patrimony of the Faculty of Silviculture and forest engineering, Transilvania University of Brasov is reviewed, catalogued and analysed. The data concerning the zoogeographical distribution, collecting period and the degree of rarity of the conserved specimens is analysed, and the obtained results are discussed. Also, museological data concerning the collection organisation, the material storage and conservation status of the material are discussed, the importance of the collection being emphasised.*

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Can Agroforestry Systems Reduce the Pressure on the Forest Area?

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Abstract: *Agroforestry systems, understood as different associations between agricultural (and/or forage) crops and forest species, on the same land area, have developed over the last five decades, mainly as a way of preserving natural resources, but also to increase production and as a way of mitigating climate change. Depending on the type of agroforestry system performed/encountered in a certain area, one of the functions they perform has priority character. Any type of agroforestry system would be analyzed, it is found that obtaining agricultural and forestry production is a priority objective in their achievement, which makes them profitable and attractive.*

The study aimed to analyze, in a first stage in the theoretical way, what are the economic benefits for the main types of agroforestry systems met, even if some of them to a lesser extent in our country (shelterbelts, grassland with trees, alley cropping, hedgerows). In the second stage will be analyzed for a given situation (a case study) agricultural and forestry production in the case of forest shelterbelts for field protection. It will also be analyzed to what extent the forest production obtained from the forest shelterbelts for field protection can be an alternative for the supply of wood and non-wood products, mainly from the forest area.

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Spring and Autumn Phenology Monitoring in European Beech along an Altitudinal Transect in Brasov during 2021 and 2022

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Abstract: *Phenology is the key to making the right decisions for forest management. In the context in which European beech occupies the largest area of the national forest fund and it has a great economic and ecological potential, a better understanding of how the phenology of this species is responding to predicted climate changes is essential. We carried out phenological observations on European beech in five study plots, along an altitudinal transect, from 550 m to 1450 m. Phenological observations were performed during spring and autumn of 2021 and spring of 2022, twice per week, and they were based on a scale that includes 4 stages of bud's development (dormant winter bud, bud-swollen, bud-burst and at least one leaf unfolding). The senescence was calculated by applying a formula that has as variables the percentages of yellowed and fallen leaves. There is a gap of 21 days on the start of the vegetation season of the individuals from the five study plots between the two years monitored (115th D.O.Y. in 2021, compared with 94th D.O.Y. in 2022). If the process of starting in the vegetation season appears later, the period of its development will be shorter, the intrapopulation variation being also smaller. In each study plot, three sensors were installed to record air temperature and relative humidity data. The association of field phenological data with meteorological ones indicates that the start of the growing season occurs when the daily average temperatures exceed the threshold of 10°C. This study aimed to highlight the phenological differences among and within population, in order to obtain new information about the behavior of European beech along a large altitudinal transect.*

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Beech (*Fagus sylvatica* L.) Response to Climate in the Eastern Most Sites at Its European Distribution

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Abstract: *Climate change as main threat for forest ecosystems in marginal population. Climate from the last decades and simulation scenarios forecast an increase of drought intensity and frequency for the Republic of Moldova. Marginal beech populations offer important information on the capacity of this species to respond to drought, and also on the capacity/genetical to survive to an environment with low water availability. In this way 115 cores were extracted from three marginal populations in the Republic of Moldova. In this manner, three chronologies for beech marginal populations from the easternmost sites of its distribution were developed. The mean age is relatively the same for all sites (126±38 years), with maximum ages from 172 years (Plaiul Fagului) up to 210 years (Codrii).The climate-growth relationship revealed a distinct and significant response of marginal beech populations with water supplies. The vapor pressure deficit plays an important role in the beech growth mechanism. At marginal sites, a high vapor deficit during the first half of vegetation season induces low growth rates on beech.*

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Impact of Inter-Annual Rainfall Variability on Soil Fertility: A Case Study of Kasama District

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Abstract: *Kasama district is experiencing rapid urban growth since last few decades as cities are growing across the country at the expense of productive land. Recently, kasama has been identified to be on the verge of climate change, especially in the context of Inter-annual Rainfall Variability. However, cultivated soils are intensively been depleted with available nutrients(Secondary and micronutrients) in form of land use which has caused a number of problems on land cover (Vegetation Cover) and as a result of climate change (Inter-annual Rainfall Variability) affecting the agriculture sector with fertile soils (nutrient status) for high crop production. To analyze such relation, supervised classification and change detection was performed to determine spatial trend for land use land cover. The regression analysis was used and applied to explore relationship between Inter-annual Rainfall Variability, vegetation cover types (Land use land cover), crop yield and soil nutrients status. Based on this analysis, it was found that, land use land cover has increased considerably between 2000 to 2020 with positive variations in rainfall and an soil fertility in regard to vegetation cover, crop yield and soil nutrients status.*

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Dynamics of Some Structural Parameters in a Norway Spruce (*Picea abies* (l.) H. Karst) Stand Installed using Different Planting Schemes

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Abstract: *Norway spruce is one of the most important wood species in Europe. The research material is based on an experimental block with four planting variants, V1 - 2500 saplings·ha^{-1}; V2 - 3330 saplings·ha$^{-1;}$ V3 - 5000 saplings·ha^{-1}; V4 - 7510 saplings·ha^{-1}. The research aspects were: the dynamics of the number of trees·ha-1 in the range 1977-2019; the distribution of the number of trees by diameter categories; the central diameter of the base surface; the height corresponding to the central diameter of the base surface. Regarding the number of trees per hectare, 43.8% of the initial number of trees (V1), 54.1% (V2), 70.5% (V3), 79.2% (V4) were eliminated. It was statistically found that in all situations the best approximation between experimental and theoretical distributions was achieved by applying the Pearson Beta distribution function. The average diameter of the variants studied varies between 19,6±6,0 cm (V4) and 22,1±6,3 cm (V1 and V2) and the average height ranges from 23,5±3,5 m (V4) to 25,2±2,7 m (V1). Population variability in relation to height is generally low for all variants studied, indicated by a range of coefficient of variation between 10.7% (V1) and 15.0% (V4). As for the relative length of the crown (%), the values were between 28.5% (V4) and 32.5% (V1). Dynamics of some structural parameters in a Norway spruce stands installed using different planting schemes should be taken into account to establish the most efficient methods and models for Norway spruce stand management.*

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Satyagraha a Gandhian Approach of Building Grassroots Institutions & Leadership to Sustain Rural ecoLogy, Livelihood and Governance of Commons

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Abstract: *The author works with poor tribal communities to build resilient village institutions for peacefully resolving conflicts over common land for improving livelihood, land governance in South Rajasthan, India. Commons like forests, revenue land and village pastures constitute 73% of the total geographical area. Commons are excessively privatized, degraded and contested. Due to increased value of land in the region, now commons are under even greater threat from tourism industry and mining mafias.*

Over last 50 years, a local NGO Seva Mandir with which the author is still associated has worked to build village institutions- Gram Samuhas. Following Gandhian approach of Satyagraha, Gram Samuahs persuade encroaching families to vacate the common land in public interest. In spite of being threatened from economically and politically powerful mafia, village communities and leaders have peacefully sustained their movements to decolonize commons. Thus, the process of Satyagraha is complex, and cumbersome. Often, negations fail. However, following path of Satyagraha Seva Mandir and Gram Samuhas have been able to alter distorted property relations in more than 350 villages to bring their village pastures and forest land under common property regime. It has paved the way for equitable, harmonious and sustainable land governance. Communities could also achieve a balance between their livelihood and overall rural ecosystem.

Satyagraha - Is truthful persuasion to change the mindset of the opponent.

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Relationship between *Phoretic mites* and *Ips typographus* (Linnaeus, 1758) (Coleoptera: Scolytinae) Population in Coniferous Forests in Romania

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Abstract: *In coniferous forests, the dynamics of bark beetle populations is closely related to climatic and seasonal conditions, including phoretic mites. The relationship between bark beetles and phoretic mites has been intensively studied in North America and some European countries, but there are scarce information regarding the phoresis of mesostigmatid mites on bark beetles in Romania. This reseach aim to study some important aspects of the complex relationship between the bark beetle Ips typographus and phoretic mites in four outbreaks in the Brașov area. To achieve this goal, 1286 Ips typographus beetles, captured between May and July 2018 with commercial wing traps primed with AtraTYPPULS lure, were analyzed. Almost half of them (45%) where phorezed by six species of mites, namely: Dendrolaelaps quadrisetus Berlese, 1920, Trichouropoda polytricha (Vitzthum, 1923), Histiostoma piceae Kramer, 1876, Urobovella ipidis (Vitzthum, 1923), Cercolepus spp. și Proctolaelaps fiseri Samsinak, 1960. In 3 of the 4 sample areas (Predeal, Poiana Brașov and Cotul Donului), the phoretic rate was higher in the case of Ips typographus males compared to females. Most of the mites were identified on beetles body under the elytra (35%) followed by the elytral declivities (22%) and torax (20%).*

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The Influence of the Structure on the Health State of the Pine Stands Installed on the Degraded Lands in the Vrancea Subcarpathians

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Abstract: *The eco-protective and ameliorative capacity of pine forests located on degraded lands is influenced by both their structural characteristics and their state of health. The stand diversity depends largely on their structure, through the intra- and interspecific relationships between trees, but also by the physical environment of the forest site. The paper presents the influence of structural characteristics (density, planting schemes, age) on the health of the pine forests in the researched area. From the analysis of structural data, it was found that as the stands getting older, the density index iN is inversely proportional to the spacing index (sHart-Becking %), in the case of intense interspecific competition. The adjustment of the experimental values after the theoretical Beta distribution for diameter indicates standard deviation between ± 0.40-0.97, with asymmetry indices between 0.63-0.72. The health state of pine forests was analyzed by the percentage of defoliation and by the nature and intensity of damage caused by harmful abiotic factors (wind, snow). Out of a total number of 963 evaluated pine trees, 82.76% are moderately damaged, with the defoliation percentage between 26-60%. The most common damages occur in Scots pine trees, the symptoms being the discoloration of the needles and the breaking of the trunk and the top (63-93% of the total number of evaluated trees). The knowledge of the state indicators contributes to the optimization of the structure dynamics through adaptive forestry works and to the increase of their stability to the action of the harmful factors, thus ensuring the forest functionality.*

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Management Goals for Mixed Beech-Coniferous Stands from Romanian High Productivity Sites

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Abstract: *Stand productivity is dependent on-site conditions and stands structure. This study refers to the management goals established for mixed beech-coniferous stands located in high productivity sites, from the Gurghiului Mountains in Romania. The stands are characterised by multi-aged structure, due to the shade-tolerance character of species participating in the mixtures and the applied silvicultural treatments. The stands were inventoried in sample areas of 0.25 - 1.0 ha (a total of 7976 trees inventoried). Biophysical characteristics of the forest that can be established as stand management goals were analysed: target tree diameter (i.e., tree mean diameter considering basal area) measured at 1.30 m and below the crown (i.e., at pruning height), the number of trees, their basal area, the volume specific to diameter classes as well as the target composition. The relations between these characteristics were embodied in mathematical models, statistically assured. The models indicate target values for the main biophysical parameters of spruce, fir and beech. The predicted values of the models were compared with those retrieved from yield tables corresponding to pure stands. The models estimate these values with a root mean square error (RMSE) between 0.77 and 2.17.*

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Black Pine Health and Growth outside Its Habitat in the Romanian Carpathians

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Abstract: *In the last decade (i.e., 2012 – 2021), coniferous stands located outside their habitat have shown significant negative growth trends. Our study, focused on the condition of 105-year-old black pine stands (inventoried through six sample areas of 2500 m^2 following the design specific to ICP forest networks, level II) reveals an increase in the percentage of trees defoliation over the decade, from 17% to 38%. In the 2015 inventory, 6.4% of the trees were already dry and other had a dry top (1.1%). By the year 2021, dead fallen trees reached the threshold of 13.5%. During the last decade, the average radial growth of trees has continued to decline, reaching mean value of 0.33 mm/year. Furthermore, part of the trees' needles continues to partially colour, tending to brown, therefore increasing defoliation percentage. Thus, the future of pine stands in the area is uncertain, given the dynamics of stands health in which the pine is unable to regenerate naturally. However, under the pine layer it develops an abundant youth of native broadleaves that could lead to future stands. All these processes take place in sites from the Postavaru Massif with calcareous substrate and superficial rendzinic soil, located on south-eastern slopes, severely tilted, at altitudes around 750 m and with a mean annual temperature around 7.5 °C.*

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The Romanian National Catalogue of Virgin and Quasi-Virgin Forests - A Powerful Instrument for the Protection of High Degree Naturalness Forest Ecosystems

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Abstract: *Romania has made consistent efforts to conserve its natural forest ecosystems during last decades. The Ministry Order 3397/2012 established the criteria and indicators for virgin and quasi-virgin forests, while the MO 2525/2016 established the National Catalogue and the methodology for the inscription of forest stands in the Catalogue. During 2019 and 2020, the Romanian Ministry of Environment, Waters and Forests tried to identify all virgin and quasi-virgin forests (PVQ) and fill in the National Catalogue. The last official version of 15.12.2021 comprises 721 sub-parcels of virgin forests - 8579.80 ha and 3821 sub-parcels - 61489.23 ha - of quasi-virgin forests. Most virgin and quasi-virgin forests are grouped in the inaccessible terrain conditions, mainly distributed in high-mountain areas. The virgin and quasi-virgin forests constitute a very powerful instrument for the conservation of the forest ecosystems with high degree of naturality. This paper presents the distribution of these forests by altitudinal vegetation levels and calls for the establishment of these forests as subject of long term scientific research on the natural forest ecosystems.*

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Forest Ecosystem Services: Impact of Trees on Human Health

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Abstract: *Time spent in nature, particularly forests, has traditionally been valued and nourished by humans in many forms. Various ecosystem services studies have recently presented findings in order to describe and value all products and benefits given by nature. Trees have always played a vital role in many civilizations on a worldwide scale, but recent medicinal research have revealed a clear relation between time spent among trees and the quality of our lives and health. Various studies in this field have shown that spending time in the forests can reduce stress, lower blood pressure, and boost the creation of cancer-fighting lymphocytes. It's still unclear which forest components have a favorable impact on human health, but it's thought that biogenic volatile organic compounds (BVOCs) derived from trees, also known as phytoncides, play a key role. This preliminary research has a focus on defining the presence of these compounds in two coniferous tree species growing in Serbia, Norway spruce (Picea abies (L.) Karst.) and Serbian spruce (Picea omorika (Pančić) Purk.) using a headspace-sampling technique coupled with the gas-chromatography-mass spectrometry. The findings revealed the existence of several BVOCs that have been previously identified as having anti-cancer, anti-viral, and anti-microbial biological activities. The presented results reveal a species-specific markup for this study topic that might serve as a foundation for valuing forest ecosystem services in terms of their influence on human health.*

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Assessment of Genetic Variability in Scots Pine (*Pinus sylvestris* L.) Provenance Trials in Romania

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Abstract: *Scots pine (Pinus sylvestris L.) is one of the most common trees as it covers more than 145 million hectares (3.7% of the world's forest area). The natural distribution area of Scots pine has been considerably reduced as a result of the expansion of other tree species and is currently estimated to be around 9000 ha in Romania. The study aims to investigating 1) genetic variability in the economic and adaptive traits among Scots pine provenances tested in field trials 2) phenotypic correlations between traits 3) genotype x environment interaction and 4) selection the best provenances in terms of growth, wood quality and adaptive traits. The material for the study consisted of 34 Scots pine (Pinus sylvestris L.) provenances—twenty-five Romanian and nine foreign, from Hungary (six) and Poland (two). The provenance trials analyzed in this study were established in 1980 in four locations: Traian, Bicaz, Hârlău, and Soveja. The observations and measurements on growth, wood quality and adaptive traits were collected in 2013 at thirty-three years old.*

The results, based on provenance trials, indicate significant interpopulation genetic variation. The environment factor was also significant. Consequently, the response of the species to climate change will depend on the environmental conditions of the planting site but also on the provenance.

Knowledge the geographical genetic variation of species is becoming increasingly important in context of climate changes, in order to establish the appropriate strategies for the conservation of forest genetic resources, to improve species adaptability to climate change and to continue the breeding program.

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Current Activities and Challenges Facing the North Central Forest Enterprise - Gabrovo

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Abstract: *The North Central State Enterprise was registered on June 28, 2011. It covers the area of five administrative districts and includes 16 territorial divisions (state forestry – 12, hunting - 4). The total area of the North Central State Enterprise forest territories is 393,727 ha, 246,618 ha of which are state forest territories (63%).*

The main activity is related to managing state-owned forests. The main revenues come from the sale of wood and from organized hunting tourism. In order to maintain the eco-balance and biodiversity of the territories, a number of activities related to afforestation of forest territories and game resettlement are carried out annually.

The poster presents the main problems facing the enterprise activities.To solve these problems, the Enterprise needs the support and cooperation of scientif.

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Forest engineering

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Simulating Log Quality Driven Transport Strategies

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Abstract: *Fresh roundwood loses quality during storage at roadside primarily through blue stain and insect infestation leading to wood value loss. The potential of wood quality forecasting in order to prioritize wood piles at devaluation risk for transport has yet not been evaluated thoroughly. Consequently, a virtual wood supply chain environment based on a discrete event simulation platform was developed to dynamically implement sea level-based risk forecasts for blue stain and insect infestations in order tosimulate unimodal and multimodal wood supply chains and to track roundwood quality development from roadside stocks to the forest based industry. This enables to evaluate both, relationships between lead time and wood quality devaluation as well as innovative transport strategies. Regression analyses of the results indicate that lead time is a significant predictor of the downgraded wood amount, explaining over 84% of the variance of downgraded wood in linear as well as over 98% in quadratic and cubic relations, respectively. Thus, complete avoidance of wood quality loss can be achieved, if transport capacities are synchronized with harvesting capacities to keep lead times short. Increasingly frequent and extensive forest calamities produce salvage wood amounts that dramatically exceed regional available transport capacity and under these circumstances, strategies using wood quality forecasts significantly outperform those currently used by preventing on average 57% of the roundwood devaluation. Up to 25% additional truck transport capacity in peak periods of wood devaluation risks decreases devaluation by 73%.*

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TECNO WOOD Project: A Regional Forestry Wood Quality Supply Chain Project, Based from a Technical, Economic and Environmental Point of View

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Abstract: *The main objective of the TECNO WOOD project, supported by Grants from Regione Calabria PSR 2014–2022—Mis. 16.1.1 – Phase 2 "Id N. 04250018308", is to create a Cooperation Group (CG) gathering public and private subjects, research bodies and companies operating in the forest sector to develop a local and sustainable wood supply chain. The project objective is to create a local vertical chain that uses the by-products of forestry operations from both ordinary operations, creating a model of forest management. The sustainable use of forests and forest landscapes are the goals of the innovative project and "Calabria Model Forest" can represent a virtuous form that is based on the principle of a broad partnership, which works on the sustainability of the forest, and is the preferential and strategic way to increase, through innovation and governance, of the quality of life in rural areas. It is therefore a question of forest territories administered according to the principles of sustainable forest management, where all possible conflicts between the different subjects, which interact with each other, are solved, preferably and preliminarily, with meetings with voluntary participation. In this sense, management choices are made as transparent as possible, shared and representative of all the interests at stake, especially social and public utility interests, which enhance the multifunctional role of the forests themselves.*

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Global Overview of Industrial Roundwood Long-Distance Transport on Roads

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Marek IRDLA[16] Christophe GINET[17] Thomas PURFÜRST[18] Hans-Ulrich DIETZ[18]
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Abstract: *The aim of the survey was to clarify gross vehicle weights (GVWs) allowed on roads in the domestic timber-trucking logistics of different countries, the share of the road transport of total industrial roundwood long-distance transport volumes, and the average payloads, transport distances and costs of industrial roundwood long-distance transport. The inquiry was sent to a total of 30 European countries with the biggest industrial roundwood removals. Furthermore, the inquiry was sent out to selected major forestry countries in the world (Argentina, Australia, Brazil, Canada, Chile, China, Japan, New Zealand, South Africa, Turkey, United States of America, and Uruguay) in February 2022 and closed in June 2022. A total of 32 countries participated in the survey. GVWs allowed on roads in timber trucking ranged from under 40 tonnes to over 70 tonnes. The results depicted that higher GVWs signify larger payloads in timber trucking. The survey revealed also that road transport is the main long-distance transport method of industrial roundwood in most of the responding countries. The road transport distance of industrial roundwood averaged 113 km. The average road transport cost was approximately €9.3 ($10.5) per tonne of timber. The survey illustrated that relatively low GVWs and long transport distances increase transport costs. Most of the respondents complained about the absence of comprehensive official statistics, and some experts could not answer all questions or – alternatively – they gave their own best estimates as a replacement. Therefore, up-to-date statistical data on the long-distance transport of industrial roundwood is needed in some countries.*

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Impacts of LHVs on Operations and Profitability of Timber Transportation: The Case of Finnish Operating Environment

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Abstract: *The aim of this study was to find out how timber transport entrepreneurs perceive their operating environment in respect to larger and heavier vehicles (LHVs). A total of 100 contractors responded to the survey. The survey was conducted using the e-form online service, which could be used via a URL link provided by e-mail. The questionnaire contained three sections: A) background information, B) transport vehicles, C) operating environment. Five-point Likert scales were used in sections B and C. In addition to data description values, the Mann-Whitney U test was used to compare the responses of entrepreneur groups. They felt that the 76 t vehicle combination is best suited for transporting timber when transport starts from forest storage. When the analysis considered transport from terminals, 76 t combinations remained the most popular, but the popularity of >76 t combinations increased relative to ≤76 combinations. The farther the LHVs operate from the highways towards forest roads, the less suitable the road network was perceived for timber transports. The results also show that driving and rest time regulations as parts of working time legislation were perceived as the most disruptive regulations. Further, the availability and responsiveness of technical support and the long delay in correcting questions of drivers were critical problems for efficient utilizing of in-vehicle ICT-application. The profitability over the past five years (2014–2018) had declined more often among entrepreneurs with ≤68 t combinations. When looking at the development of profitability over the next five years (2019–2023), the responses changed in a more positive direction compared to previous years. However, the current skilled workers are retiring and there are too few educated ones to replace them. This is expected to increase wages, which may be reflected in decreased profitability in timber transport sector in the future.*

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Combination of a NIR Sensor and a Geostatistical Approach to Estimate Moisture Content of Woody Biomass

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Abstract: *A correct estimate of the moisture content (MC) of woody fuel is crucial for the bioenergy sector. The current standard for MC measure relies on samples collected from the pile or truckload and dried in oven. But this method does not meet the necessity for a fast response regarding this key quality parameter. Furthermore, sampling methods are often unreliable as the MC can be unevenly distributed in the biomass. This is particularly true for large piles even after a short storage period. With this presentation we propose an adaptative sampling system and geostatistic approach to estimate the MC of piles of wood chips. This methodology is possible thanks to the deployment of portable NIR sensors running dedicated models and returning a real-time estimate of MC. The advantages of this measurement technology and the proposed methodology will be discussed with real-cases data.*

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Performance of UHF RFID Tags in Tracking Timber Products at Mill's Gate

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Abstract: *The development of precision forestry techniquesrequires reliable tools to identify single items (trees or logs) and relate them to the database of the digital forest inventory. Radio Frequency Identification (RFID) is regarded as one of the most promising systems as it features the possibility to perform bulk reading at relatively long distances (> 2m). In timber supply chains this would allow to automatically identify at mill's gate all the logs carried by trucks, disclosing several opportunities for product track and tracing services. Yet, for commercial application it is essential that all of the marked items can be correctly identified. This is still a challenge in timber logistics due to the specific conditions of this operation. The study tested a new model of RFID tags (Sundog), specifically designed for timber marking, comparing its performance with a common tag model designed for logistic of goods. Commercial roundwood on timber truck was marked with both types of tags. An RFID gate with 4 fixed antennas was set up, comparing different configurations. Additionally we tested manual reading system based on a telescopic antenna. The Sundog tags strongly increased the performance of automatic bulk reading, yet about 13% of tags could not be identified. Improved manual reading proved capable of identify 100% of Sundog tags and 90% of common RFID tags, but the operation requires about 90 seconds and must be performed on a stationary condition. Further studies are ongoing to define the reliability of the solution throughout the whole supply chain.*

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Potential of Measure App and of the Integrated Augmented Reality and LiDAR Technologies in Estimating Log Biometrics: A Comparison with Conventional Log Measurement

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Abstract: *Wood measurement is an important process in the wood supply chain, which requires advanced solutions to cope with the current challenges. Several general-utility measurement options have become available by the developments in LiDAR or similar-capability sensors and Augmented Reality. This study tests the accuracy of the Measure App developed by Apple, running by integration into Augmented Reality and LiDAR technologies, in estimating the main biometrics of the logs. In a first experiment (E1), an iPhone 12 Pro Max running the Measure App was used to measure the diameter at one end and the length of 267 spruce logs by a free-eye measurement approach, then reference data was obtained by taking conventional measurements on the same logs. In a second experiment (E2), an iPhone 13 Pro Max equipped with the same features was used to measure the diameter at one end and the length of 200 spruce logs by a marking-guided approach, and the reference data was obtained similar to E1. The data were compared by a Bland and Altman analysis which was complemented by the estimation of the mean absolute error (MAE), root mean squared error (RMSE) and normalized root mean square error (NRMSE). The results indicate a high potential of replacing the conventional measurements for non-piled logs of ca. 3 m in length, but the applicability of phone-based measurement could be readily extended to log-end diameter measurement of the piled wood. Further studies could check if the accuracy of measurements would be enhanced by larger samples and if the approach has a good replicability. Finding a balance between capability and measurement accuracy by extending the study to longer log lengths, different species and operating conditions would be important to characterize the technical limitations of the tested method.*

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Productivity and Fuel Consumption in Skidding Oak Round-wood on Flat Terrains by Farm Tractors

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Abstract: *Productivity assessment studies are essential in forest operations, mainly because their results enable operational planning and rate setting, development of equitable payment systems, assessment of environmental performance, assessment of improvements brought by technology development, and optimization of larger forest-based systems. This study examines the productive performance and fuel consumption in farm-tractor based skidding operations implemented in flat terrain oak harvesting. Two felling areas were selected to monitor the operations and detailed statistics and predictive models were developed at two resolutions by an end-to-end assessment. Based on 56 observed work cycles, and for average values of the number of logs, payload volume, winching distance and extraction distance of 4.96, 1.81 m^3, 14.43 m, 177.3 m, respectively, the net efficiency and productivity rates of skidding operations were estimated at 0.125 h/m^3 and 8.03 m^3/h, respectively. At the resolution of piece-by-piece winching, winching time depended only on the winching distance. At the resolution of overall skidding operations, the skidding time depended on number of logs in a payload, and average winching and extraction distances. The same predictors were relevant in explaining the fuel consumption in skidding operations, which accounted for 3.72 l/h or 0.46 l/m^3, while there was a variation in fuel consumption induced by the type of operation. Improvements in efficiency, productivity and fuel consumption may be achieved when dealing with less logs per turn and higher volumes per piece.*

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Performance of Processor Tower Yarder in Regenerative Cut in Coniferous Forests

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Abstract: *The main goal of this study was to evaluate operations of Processor Tower Yarder (PTY) in coniferous forests on steep terrain, managed by the shelterwood system, with regard to economic aspects. The study was carried out in the Sredna Gora Mountains, Central Bulgaria, in 100% Scots pine stand. The mean productivity of truck-mounted PTY (15.20 $m^3 \cdot PMH^{-1}$ and 12.29 $m^3 \cdot SMH^{-1}$) is mainly influenced by the productivity of the yarder unit, which determines the technological process and indicators of the multi-operational machine.*

Under the given conditions, the performance of PTY can be significantly increased if more than one tree are attached and extracted per yarder cycle, since the productivity of the processor is approximately twice that of the yarder.

The gross costs of studied PTY were calculated at 297.482 € per productive machine hour and 16.17 $€ \cdot m^{-3}$. The variable costs (75%) predominate in the net costs distribution, followed by the fixed costs (15%) and the labor costs (10%).

The time, productivity and cost results obtained show the high efficiency and level of integration of PTY operations in order to achieve economic and environmental efficiency of logging in montane coniferous forests in sensitive sites.

The PTY, compared to other machines, is production and cost efficient and minimally labor intensive in logging operations in coniferous forests on steep terrains, managed by the shelterwood system.

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Detection of Coverage / Land Use Changes in Semi-Mountainous Forest Suburban Area

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Abstract: *Changes in land use and land cover date back to prehistoric times and are the direct and indirect consequence of human actions to secure the necessary livelihood resources. The use of land and natural resources, as an expression of the natural environment, in the past was based solely on the highest economic gain without taking into account the effects on the natural environment. The spatial planning of the development of the semi-mountainous areas, presupposes the intertemporal control of the land uses in the four main axes of development, namely agricultural, livestock (meadow), residential and forest use. The purpose of this study is to monitor and record the intertemporal evolution of land cover / land use changes in a semi-mountainous suburban area, in order to identify and determine the size and causes of forest land use changes. The problem of recording land uses of older years is solved only with the use of photogrammetry and old aerial photographs. Thus, in the framework of this paper, maps of land use of past years and modern years were compared, with the help of aerial photographs and a digital photogrammetric instrument, in the suburban area of Lagyna Lagada in the Prefecture of Thessaloniki. From the comparison of the maps, conclusions about the prevailing land use and the established land use trends were drawn.*

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Financial Support to Forestry in the Context of Forest Bioeconomy - The Case of the Czech Republic

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Abstract: *The concept of forest bioeconomy is a trend across the world and Europe that brings a new perspective on the use of natural resources (with an emphasis on forestry). In recent years, financial quantifications of the contribution and support of the forest bioeconomy have appeared in various countries. Considering the definition of the forest bioeconomy, the question arises as to whether it is possible to compare the figures with each other and whether it is possible. The contribution is focused on the concept of forest bioeconomy of selected EU states, and a common/unified view of forest bioeconomy will be illustrated on the example of forestry financing in the Czech Republic.*

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Forest Bioeconomy in the Czech Republic – Current State and Outlook for the Future

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Abstract: *As in other European countries, increased attention has been paid to the bioeconomy in the Czech Republic in recent years. The contribution evaluates the development and current situation regarding the issue of forest bioeconomy, including its inclusion in strategic materials at the national level. The Czech Republic has not yet adopted a single conceptual document that would comprehensively address the issue of the bioeconomy (and therefore not even the forest bioeconomy separately), and thus it is only possible to analyze partial strategies that have been adopted by various official bodies (mainly ministries). The fragmented concept of forest bioeconomy, including inconsistently used terminology in the Czech Republic, complicates the acceptance of forest bioeconomy by the public, but often also among experts. The above information is also placed in a relevant European context, especially through comparisons with selected countries. A partial part of the contribution is also familiarization with the activities of the Faculty of Forestry and Wood Sciences of the Czech University of Life Sciences Prague, which are focused on the bioeconomy in the conditions of forestry (especially research and publication outputs).*

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Evaluation of Deformations of the Forest Road Pavements by Using the Finite Element Method

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Abstract: *Soil deformation produced by trucks and other vehicles into the forest road pavements plays a significant role for the sustainable harvesting. The objective of the presentstudyis to analyse the deformations of forest road pavement made of three-layers as a function of trafficintensity and type of trucks which are running the forest road. The finite element method was used. Two types of forest trucks, namely Volvo FH 12.A60 and Mercedes – Actros 2646 were considered for analysis in this study. Surface force was determined and calculated along curb displacement values on the road. Based on the findings in this work it appears that the maximum displacement took place in the middle of the contact surface between the ground and wheel of each type of truck. Also, the results indicate that the maximum remanent deformations occur after passing the rear wheel - axel 2 and the remanent deformations are higher after the last wheel passing and the residual deformation can increase significantly. Data found in this work would be used for harvesting activities controlling adverse influence of the force transferred on the road surface so that top soil is not damaged.*

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Rational Forest Opening-up as a Tool for Sustainable Development and Exploitation of the Semi Mountainous Areas in Greece

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Abstract: *Investigation, reliable knowledge, complete and accurate inventory, mapping, and monitoring of natural resources are a fundamental infrastructure for their proper management and utilization, but also for any design and development and environmental protection program.*

The problem of optimization of a transportation network and more specifically the road network has been the subject of intense study on account of the essential importance involving the plan of development policy, among the different countries.

The integrated opening-up of a semi-mountainous forest area (with forest roads and skidding trails, tractor roads, hauling roads, ropeways, and slides) causes a significant intervention in the natural environment that must be examined very critically from an ecological point of view because of its impacts on it.

However, since the opening-up of forests is necessary and inevitable to achieve the rational management of forest ecosystems, with their simultaneous protection, for the sustainable development of semi-mountainous areas, a golden intersection must be found between these two different functions. A comprehensive evaluation including all the points of view could be attempt by the method of cost-benefit-analysis.

This paper aims to improve forest road network and the skidding and transport conditions of wood to meet the conditions for a rational management of the forest.

The research area is the public forest of Trigono. Based on the relevant processing of the data have been received, the necessary improvements to the road network are determined and opening-up of the forest, improvements to the existing roads and maintenance of the existing roads are proposed.

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Multi-Criteria Assessment of the Environmental Construction and Operation of a Forest Road from a Forest Technical Point of View

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Abstract: *A considerable part of the environment in which man lives today is the result of human-made plans and decisions. Design can be found in all sectors of human life. Plans are leading actions not only in the economy but also in politics, administration and in most of the private matters. The problem of providing quality access to the Greek forests and the lack of established direction for carrying out the planning and analysis tasks has led to create a protocol for forest accessibility. The construction of forest roads that began to be done in the Greek forests mainly since 1950 has developed in the last three decades in degree and extent, to satisfy the basic requirements both for the integrated opening-up of the forests and for serving the multiple purposes of forestry. The basic demand is quality access and the cost for providing such high-quality access is potentially high, from the security point of view. Past solutions have mostly failed to meet today's needs and requirements. This protocol represents how studies of specific forest areas can be done. Also, it tries to compromise high-quality access, safety, minimum cost, and compatibility with the environment. The aim of this paper is to investigate the impacts of forest road construction on the natural environment. The paper sets the criteria and the parameters affecting a forest road and determines the weight of the intensity and absorption criteria of the ecosystem. Its flexibility enables its wide use according to the needs and features of the area to which it is applied, defining global work guidelines, recommended technologies, techniques and method.*

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The Changes in Chemical Composition of Narrow Leaved Ash Wood in regard to the Conditions of the Acetic Acid Pretreatment

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Abstract: *Different pretreatments (physical, chemical, biological) have different effects on various properties of wood. The effects of chemical treatments depend on the type of reagent and treatment conditions. This work evaluates the influence of the concentration of acetic acid solution and the treatment temperature on the chemical composition of wood particles (0.5-1 mm) of Narrow Leaved Ash. The particles were treated in autoclaves during 60 minutes and at the temperatures of 100 and 120 °C. The applied concentrations of acetic acid solution were (0.03, 0.06 and 0.09 g/g ODW). The treatments have slightly increased the content of both cellulose (1-9%), and hemicelluloses (4-30%). The concentration of acetic acid showed no significant effect on these compounds at the treatment temperature of 100 °C. However, at 120 °C the content of cellulose decreases with the increase in acetic acid concentration, probably caused by its degradation. The changes in lignin content after the treatment at 100 °C was no significant (0.7-2.3%), but it was about 7% lower after the treatment at 120 °C. The lignin content was not affected by the acetic acid concentration. The treatments had the most pronounced effects on the extraneous components, significantly lowering their content. Hence, the contents of extractives dissolved in toluol/ethanol mix and in water decreased for 12-54% and 73-88% respectively, while the mineral mater decreased for 62-81%. The content of extraneous materials was higher for the particles treated at 120 °C, which is probably caused by the increase in lignin degradation at higher temperature, but it decreases with the increase in acetic acid concentration. FTIR spectra have confirmed that the treatments had no significant effects on the content of main constituents of wood.*

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Methods for Seedbed Preparation in Forestry Nurseries

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Abstract: *This paper presents the results of our research regarding the six methods for seedbed preparation in nursery of the West of Romania. These methods are: Vibrocombinator equipped with Gama type active organs (Vibro_Gama), Vibrocombinator equipped with Delta1 type active organs (Vibro_Delta1), Vibrocombinator equipped with Delta2 type active organs (Vibro_Delta2), Disc harrow (Disks), Cultivator (Cultivator) si Rotary harrow (Rotary harrow). In order to evaluate the most efficient method of preparing the germination bed, the following physical-mechanical properties of the soil were determined: moisture, bulk density, total porosity and soil compression degree and water retention. In order to carry out the research, we settled a nursery of the West of Romania so that we could have six methods for seedbed preparation. From each profile were collected soil samples in three steps of 5, 10 and 15 cm. For each sample six repetitions were performed (N = 6). We started by measuring the particle size distribution (granulometric composition) and the main physical properties of the soil. The advantages of using vibro-combinators are: perfect preparation of seedbed in difficult working conditions and preservation of soil moisture. Such important factors can ensure fast, uniform and early germination of seeds, these requirements standing at the basis of abundant harvests. The research investigated the soil tillage performances and the environmental impact of several active elements, at certain soil depths.*

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Do the Socio-Demographic Features Control the Willingness to Pay for Conservation of Tropical Forest-Based Benefits in Ecuador? A Prospective Study by Unsupervised Machine Learning

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Abstract: *Willingness to pay was identified as one of the core techniques to evaluate civil commitment in supporting the conservation of endangered landscapes. Relating it to the socio-demographic characteristics is important to forecast the public support in conservation initiatives, while new methods of statistical learning could be useful for such attempts when dealing with big data. Based on a questionnaire survey implemented to 451 respondents, a machine learning approach was taken in this study by the k-means clustering technique to distinguish between those willing and not willing to pay for conservation of tropical forest-based benefits in a representative area of Ecuador. Although two cohesive clusters were found having as a target variable the willingness to pay, they were not consistent in terms of socio-demographics, indicating that other parameters might be important and need to be pursued by future studies profiling the willingness to pay against the socio-demographic variability. Along with a statistical description of the two clusters and their subgroups, the study provides prospective data on the commitment to pay for conservation, differentiation in socio-demographics and amounts, as well as the presumptive annual amounts which could support the conservation of forests in the area assuming that proper mechanisms would be implemented.*

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Using the Land Transformation Model to Forecast Deforestation in Zagros Sparse Coppice Oak Forest

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Abstract: *In this paper, we employed the LTM, which couples GIS with ANNs to forecast deforestation of Sardasht forests for the next 30 years. For this purpose, our approach used three different scenarios: Scenario 1 (input patterns from 1997 and 2007), Scenario 2 (input patterns from 1997 and 2017) and Scenario 3 (input patterns from 2007 and 2017), and deforestation of Sardasht using 14 demographic, socio-economic and environmental variables was predicted. Results showed that over 20-year studied time period 10314.63 ha deforestation occurred in Sardasht. Deforestation modeling by all three scenarios with good Receiver Operating Characteristic curve (ROC curve) (more than 0.8) for all scenarios, show a definite and increasing deforestation process in Sardasht over the next 30 year, so based on the 1997-2007 scenario, it is anticipated that 22296.24 ha of forests in the region will be destroyed over the next 30 years. The results of this research can be used for proper conservation planning and increasing regulatory programs in areas with high degradation potential.*

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Mapping Forest Structural Parameters using Mobile Scanners - Case Study in ROSPA0037 Dumbravita-Rotbav-Magura Codlei Site

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Abstract: *The use of laser rangefinder techniques for retrieving forest inventory parameters and structural characteristics is discussed in detail in this paper. The scales of application of the existing techniques—such as spaceborne, airborne, and terrestrial laser scanning are analized, and it is discussed how effectively, precisely, and accurately the retrieval of structural parameters has been accomplished at each scale. The article goes into further detail about the potential for combining LiDAR (Light Detection and Ranging) data with other types of remote sensing data, and it concludes with suggestions for future research and potential benefits in the use of LiDAR for the characterization of forests.*

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Forest Transport Planning with Considering the Potential Environmental Risks

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Abstract: *The problem of forest transport planning can be solved by modeling of alternative technologies and finding the optimum concept based on quantitative indicators cost of timber extraction and minimize damage of the environment too. The development such conceptual model is the main purpose of this study.*

We divided investigated system into separate interconnected modules (possibility of movement, environmental damage, evaluation of existing forest road network, cost analyst), each of this modules lean on own model.

Most models of evaluation possibilities of movement of vehicles based on the equation of balance of traction for calculation of the value of the slope on which it's possible of moving.

Damage to the bearing surface of the soil depends on the ability to withstand external loads from the forest machine without deformation. For deformation characteristics of forest soil surface is recommended to take an equivalent module deformation (ground and surface flooring).

A method of evaluation of existing forest road network consists of a series carried out actions aimed at identifying qualitative and quantitative indicators and identifies defects existing infrastructure. Evaluation criteria selected index relative transport accessibility, which is equal to the ratio of the area accessible to the entire operational area of the forest.

The proposed model allows proving environmentally safe and economically viable methods of timber extraction, to estimate the proportion of the transport accessibility of forest area by various ground-based forest machines.

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Methods of the Forest Machines on the Traffic Ground Surface Negative Impact Reducing

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Abstract: *The principles of the forest industry sustainable development largely cover the problems of logging, in particular, the harvested wood transportation. In this study, attention is focused on the negative impact minimizing possibility of the forest vehicles on the ground surfaces.*

The forest machine engine power is mainly spent on overcoming various resistance forces. Such costs are manifested in various types of destruction of the soil surface, as well as in thermal transformations of mechanical energy. Therefore, higher level of resistance forces required more power for spent to overcome them, leads to greater level of destructive effects on the soil and the environment, the greater the fuel consumption and the more material resources must be spent on maintaining a forests sustainability.

Its consider the way to reduce such losses by selection of rational operating modes - speed and load capacity, as well as the establishment of equipment permissible operation areas in view of the non-stationary effect. The determination of the operational modes outlined above energy approach implemented. The energy resource of all components of the machines movement mechanical process in soil surface established and clarified.

These are primarily processes in the soil volume: viscous flow of moisture-saturated soil, soil compaction, etc. In addition, it is the soil volume destruction, breaking off particles due to stickiness. Elastic deformation and destruction of tires, shearing of the soil in non-stationary manipulator action are also highlighted.

A rational mode of movement is established under the condition of minimizing energy losses for each specific case.

Keywords: *energy approach, sustainable development, resistance forces overcoming, rational operating modes.*

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Wildlife management

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Hunting and Human – Bear Conflicts

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Abstract: *In the current context of the conservation of the brown bear population (Ursus arctos L.), ensuring the coexistence of the species with humans is becoming more and more difficult to achieve. Thus, in order to evaluate the dynamics of the relationship between the two entities, data were collected from the Central Development Region of Romania, where the most existing human-bear conflicts in Romania were reported.*

In the period before the ban on brown bear hunting, the damage caused by bears represented 10% and attacks on people 1% of the total value. Gradually, with the increase of the brown bear population, human-bear conflicts are on the rise, and today, the damage caused represents 28% and attacks on people reach a percentage of 46%.

The ban on brown bear hunting also contributed to an increase in the number of bears ilegaly killed in the study region, due to the tensions built up by increasing conflicts, compared to the period when the brown bear could be hunted and there were rare cases of bears killed by poachers.

As a result, statistical data show that attacks on people, as well as material damage caused by the brown bear, register significant increases from year to year, and in the current situation the provisions of the Habitats Directive do not lead to maintaining the protection and the favorable conservation status of the brown bear, but rather to an uncontroled development of the bear population.

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Population Sustainability Analysis of Przewalski (Procapra przewalskii) using Vortex Software

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Abstract: *The Przewalski gazelle (Procapra przewalskii) is an endemic species of wildlife found only in Tibet's highlands. The present study focused on two populations, the Haergai and the Yanzhe. To predict the probable behavior of a population over 100 years, Vortex software (version 10) was used to perform a population viability analysis. The results of our study of the recorded demographic data revealed that the species is classified as Critically Endangered (CE), and its viability is determined by demographic and environmental characteristics rather than carrying capacity. The Yanzhe population is disappearing at a faster rate as a result of increased demographic uncertainty. The mortality of individuals of the 1st solar class has a greater impact on the viability of populations compared to other age classes. The dispersal of 3% of the Haergai population into the Yanzhe population may enhance the dynamics of metapopulations. Management policies such as habitat restoration, intensive surveillance, and predator protection programs, as well as the strengthening and creation of biological pathways, are also important in facilitating the increase of genetic diversity among subpopulations.*

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Sex-specific Connectivity Modelling for Brown Bear Conservation in the Carpathian Mountains

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Abstract: *Romania is currently one of the best-connected landscapes, with high-quality habitats and a high density of brown bears. However, regional development measures are needed for the nation's economic growth, and without responsible government actions, these measures pose a threat to brown bear connectivity, a vital pillar of the entire Carpathian region. Despite having important implications for the species conservation, bears sex-specific behaviour has been overlooked in connectivity assessments.*

The study's main goals were to i) develop sex-specific distribution and connectivity models, ii) assess the movement patterns differences between females and males, and iii) identify high-quality areas to be secured for species connectivity conservation.

We designed a methodological framework based on interdisciplinary approaches and modelling tools for landscape connectivity combined with novel spatial analysis. Telemetry data of sixteen bears (females and males) were utilized to predict habitat selection (MaxEnt), and circuit-theoretic approaches (Circuitscape) were applied to identify the potential movement corridors of both sexes and high-priority areas.

The obtained results provided new evidence on the uneven movement patterns and pathways used by males and females in the study region. Males' movement preferences were related to river shores and dense forest coverage areas, avoiding urban areas, while females were predicted to move across forested and open areas and were more tolerant to human-modified areas. Three high-quality areas were delineated for both sexes, and connectivity conservation efforts are needed due to the vicinity of anthropic pressures.

This study depicts the usefulness of combining interdisciplinary approaches and provides planners, managers, and decision-makers with practical solutions to address sustainable design and management within the intervened landscapes. Using separate female and male spatial models for leading management and conservation measures, setting connectivity targets within environmental and impact assessments while adopting conservation easements could secure a safety network for biodiversity conservation in the Carpathians.

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Educated Wildlife: Using Existing Underpasses for "Crossing" the Crowded Infrastructure

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Abstract: *Wildlife interactions with humans are more and more frequent nowadays since urbanization and the human population are rapidly developing. Car accidents where wildlife is involved are a significant threat for some species, especially in combination with factors such as habitat loss. More than that, car repair costs after these accidents are very high. Road ecology is an effective and essential tool in understanding and reducing these interactions in which humans and wildlife are injured or killed. More and more crossing solutions are used all over the world in order to mitigate these crossing areas, especially on highways. Our study is located near Brasov city, on three national roads (DN1, DN1A, DN13), DN1 being one of the busiest roads in Romania. We used surveillance cameras to monitor the wildlife crossing under ten bridges from these busy roads. The experiment started in March 2022, and since June, we have registered 372 animals crossing different species, which can be translated into the same number of potential car accidents. These bridges were built before the concept of road ecology appeared, with the only purpose of allowing the water to pass under the road. The largest wildlife species that used these structures was the brown bear, with 24 successful crossings, and the smallest species was pine registering 12 crossings. It seems that wildlife species have learned in time from their mothers that these are safe places to cross the road; witness the images of mothers of cubs from most of the species identified.*

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Structural and Functional Characteristics of Beaver Dams in Romanian Black River Basin

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Abstract: *The beaver (Castor fiber) is considered a keystone riparian species which can produce changes in the habitats substantially building structures such as dams and lodges. The construction of beaver dams has hydrological, hydraulic, geomorphological, and ecological consequences that increase the complexity of the river and its basin and the riparian connectivity. To analyze the characteristics of the dams, the main characteristics (dimensions, shape, and composition) were measured and observed. The results shows that beaver dams have lengths between 103 to 1857 cm, widths from 30 to 321 cm, and heights from 38 to 305 cm. Usually short dams are characteristic of irrigation canals and small tributaries, which, in most cases, do not exceed 4 meters wide, and large ones are characteristic of natural or artificial water courses with a valley width greater than 4- 5 meters. We also identified as most of the dams have a height of up to 1 m and are straight or convex, with straight anchorage and mainly composed of mud.*

Keywords: *beaver, dams, riparian, valley width.*

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Wildlife Management Platform

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Abstract: *The national wildlife management units, according to the current legislation, represent the totality of the hunting units, together with the game species within. According to these laws, hunting units are managed by authorized game keepers, based on a contract concluded with the Central Public Authority responsible for forestry.*

The creation of the Services for hunting species platform was carried out for facilitating the collaboration between INCDS Marin Drăcea, hunting managers and authorities. Designing the database involves the identification of relational data, the relationships between them and the restrictions on them. The design consisted of two phases: the logical design and the physical design. The logic design was carried out in consultation with managers of hunting units and INCDS researchers. In the physical design, it was decided to develop the information system with the help of the Visual Studio programming system.

The advantages of the database system are: redundancy control, data consistency, space saving for the same data, data integrity control, the use of standards, the possibility of responding to varied requests and with data visualization partially unknown at the time of design, increased productivity, increased competition, increased possibilities of recovery in case of error.

The database of the information system in the field of game species includes the following information: A. Basic data of the hunting unit; B. Informational elements regarding the game manager C. Informational elements regarding the administrator. The uploading of the database will be done online by the manager.

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Density and Distribution of Seven Woodpecker Species in Deciduous Forest from Central Romania

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Abstract: *This paper presents a studyon distribution,population size and abundance of sevenwoodpecker species withina low and medium altitude mountain from central side of Romania (Măgura Codlei as part of Perșani Mountains, 560-1292 m). The study area is included within a Natura 2000 SiteDumbrăvița-Rotbav-Măgura Codlei (ROSPA0037).Covering 1946 ha of predominantly deciduous forest, the area contains managed and unmanaged stands (about 300 ha of quasi-virgin stands). In addition, a body of oak forest and a wood-pasture of 77.5 ha (530-570 m) from the same Natura 2000 Site were analyzed. For survey, we used the playback method from fixed census points, randomly pre-established within the boundaries of the Natura 2000 forest. The most frequently identified species was Great-spotted woodpecker (Dendrocopos major) - GSW and then Middle-spotted (Dendrocoptes medius) - MSW. The rarest was Green woodpecker (Picusviridis). The most abundant species in breeding pairs (bp) were GSW (0.6-0.8bp/10 ha; 121-162bp) and MSW (0.4-0.7bp/10 ha; 81-142bp). Two species of community interestalso had high densities: White-backed woodpecker (Dendrocoposleucotos): 1-3 bp/100 ha and Grey-headed woodpecker (Picuscanus) - GHW: 2-3 bp/100 ha.They generally have higher densities than those known at Central European level. For GSW and MSW, the densities are comparable or lower than those at Central European level.Compared to the studies made in deciduous forests from the central part of Romania (Transylvania), the densities found by us are obviously higher for GSW and GHW, but relatively similar for MSW.*

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Distribution and Population of Tawny Owl (*Strix aluco*) and Ural Owl (*Strix uralensis*) in Deciduous Forests from Central Romania

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Abstract: *This paper presents a study on distribution,population size and abundance of two owl species – Tawny Owl (TO) and Ural Owl (UO)withina low and medium altitude mountain from central side of Romania. This isMăgura Codlei as part of Perșani Mountains, with an altitude of 560-1292 m and covered by about 2000 ha of forests. This area is included within a Natura 2000 Site–Dumbrăvița-Rotbav-Măgura Coldei(ROSPA0037).For survey we used playback from fixed census points randomly pre-established within the boundaries of the Natura 2000 Site forest. Based on two monitoring years (2020 - 2021) both species were relatively evenly spread over the studied area in different types of stands concerning composition, age, forest management. Tawny Owl was more frequently identified in the monitoring points. The number of individuals detected in 2020 was relatively similar for the two species (54% for TO and 46% for UO) but this situation was completely different in 2021 (63% for TO and 37% for UO). Concerning their density TO has 0.8-1.0 breeding pairsbp / km^2 and UO 0.2-0.5 bp/ km^2. Regarding the breeding population size within the study area, TO has 16-20bp, and UO has 4-10bp.Our results contribute to the monitoring program of UO as a species of community interest.In terms of further management measures these results will contribute to the species conservation measures in order to achieve a favorable conservation statusfor thisNatura 2000 Site.*

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Identification of the Types of Forest Habitats in the Riparian Areas of the Olt River Watershed

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Abstract: *Riparian areas are of particular importance in maintaining the connectivity of some flora and fauna populations and are recognized as particularly dynamic in terms of evolutionary speed, providing numerous trophic niches for flora and fauna (Malanson 1993, Naiman & Décamps 1997). The lack of a dedicated management of these stands led to their partial or total deforestation. Also, the intensive grazing produced the marked degradation of the herbaceous layer a fact that certain invasive species take advantage of, occupying large areas and drastically changing the composition of the biocenosis.*

The sampling method was applied to determine the types of habitats according to the Romanian classification, highlighting riparian habitats according to the existing list in the Habitats Directive.

Based on the Copernicus Land Monitoring Service (CLMS), 36 types of habitats were identified, of which the best represented are: irrigated or non-irrigated arable land 32.9%, natural and semi-natural deciduous forests 15.03% and the rest semi-natural pastures (52.07%).

The riparian vegetation represents only 24.6% of the total surfaces, small values compared to the existing data at the European level (69%) according to the European Report of 2021 Clerici & all.

In the category of forested areas, a clear dominance of deciduous forests is observed (59.7%). Habitats with coniferous forests, which are not characteristic of riparian forests in Romania, were eliminated from the analysis. Tree and shrub transitional vegetation has a share of almost 16%.

Riparian habitats are essential for maintaining connectivity, but are currently not being managed according to their importance.

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The Distribution and Density of Mammals Species in the Riparian Areas of Olt River

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Abstract: *The study was carried out on a sector of 450 km of the main course of the Olt River, between the springs and the Râmnicu Vâlcea.*

Field data collection was done from 139 sample plots of 500 m^2 representing 15% of the total study area.

The main criteria followed were: the number of species and the number of individuals of each species of the mammal fauna associated with the riparian zone, the presence and thickness of the vegetation strip, the main types of habitats in the areas adjacent to the minor riverbed, the anthropogenic impact and the slope of the banks.

21 species of mammals were identified, the largest number belongs to: beaver, fox, deer, mole, otter and mice (92-247 specimens). At the opposite site, the rare species were: wolf, badger, jackal and wild cat, with a very small number of specimens (1-2 specimens).

Among the 21 inventoried mammal species, the most frequent are fox, beaver and otter, which were present in more than 60% of the analyzed sample areas.

The most important semi-aquatic carnivore, the otter, mainly follows areas with rich food and is not concerned with settling in one of the analyzed terrestrial habitats. On the other hand, the beaver prefers riparian areas with rich vegetation, being dependent on the presence of woody vegetation during the winter.

Deer, wild boar, wolf and bear are present in the riparian areas near the forest, and it is obvious that they seem to be their preferred habitat for searching food.

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The History of Photo Trap Camera as a Survey Tool for Wildlife

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Abstract: *This study provides an historical review of the methodological and technological evolution of camera trapping as a species monitor survey tool. Camera trapping has a long history but, as a wildlife survey and research method, its history is fairly recent. The James Muybridge first used what modern biologists would consider a 'camera trap' in the USA between 1878 and 1884. By the mid-twentieth century, smaller photographic equipment and the replacement of the clumsy and dangerous magnesium flash powder with flash bulbs allowed further refinement of remote wildlife photography*

At the beginning the concerns regarding the use of photo trap camera were the achievement independent and multiple captures of images with the best possible quality, later with the technological development these concerns took the second place, the techniques and methods of collection and integrated analysis of data becoming a priority. The scientific publications analyzed highlighted the evolution of the use of phototrap cameras from simple presence-absence studies to more complex monitoring studies that include aspects of population ethology, ecology and estimation. Current scientific research is concerned with improving and standardizing data collection and analysis methods so that scientifically rigorous results are obtained and unbiased data are not used.

The current interest of researchers regarding the use of phototrap cameras is to use more expensive brands that offer higher speed, greater functionality, more reliability and the ability to interconnect with GIS, GPS and statistical software and data transfer via the INTERNET.

Keywords: *photo trap camera, estimation population, wildlife.*

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Carrying Capacity Calculated in the Perspective of Re-Population with Beavers of the Rivers Argeș, Dâmbovița and Buzău

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Abstract: *Restoring the historical distribution of Eurasian beaver in Romania is one of the main objectives of the species' action plan. The reintroduction of the beaver in the hydrographic basins of the Olt, Mureș and Ialomița rivers is an obvious success but the repopulation of other watercourses could represent a short/mid-term solution for reducing the level of damage from the areas with high population densities.*

The study aimed to evaluate the aquatic habitats of the rivers Argeș, Dâmbovița and Buzău from the perspective of their repopulation with beavers. The quick habitat classification method was used, which includes the main evaluation criteria established at the international level.

Taking into account the provisions of the action plan of the species adopted in 2021, optimal or satisfactory habitats that overlap with human inhabited areas, where the beaver presence would represent a major risk for the security of the population were excluded from the potential area.

The habitat classification led to obtaining the favorability profile for three of the most important rivers from SE of Romania, in Muntenia region. Thus, the optimum habitats had a weight of 25.5-45%.

The carrying capacity was calculated according to the densities obtained on the Olt River (Pașca et al, 2015) to be 470 beavers for Argeș River, 465 for Buzău River and 410 individuals for Dâmbovița River.

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Considerations Concerning the Dynamics of the Fallow Deer (*Dama dama* L.) in Romania and Particularly in the Western Plain of Romania

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Abstract: *The fallow deer was reintroduced into Romania's fauna by the Romans. However, in the last century it has found its consecration as an important species in wildlife with the growth of the population and its spread in all regions of Romania, most of the time with the help of humans.*

In the time interval 2000-2022 in the dynamics of this species on the territory of Romania, fluctuations in the population of fallow deer were observed, but without falling below the optimal level. In the period 2008-2013 there was a finite rate of subunit growth of the population of fallow deer, as a result of the decrease of the herds below the value recorded in 2000.

From the point of view of the spread of this species, we appreciate the fact that it occupies all the regions of Romania, with an obvious concentration in the Western Plain where over 50% of the national number of fallow deer is recorded.

The evolution of the fallow deer population in Romania in general and in the Western Plain in particular was determined by the anthropic factor that determined both the spread of this species and the annual or multiannual fluctuations of the population dynamics.

Keywords: *fallow deer, dynamics, finite growth rate.*

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Evaluation of the Quantity of Bushmeat Consumed Around the Lama Classified Forest in Southern Benin and Consumer Motivations

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Abstract: *Bushmeat is one of the sources of protein in the urban areas around the Lama Classified Forest. However, knowledge of the extent of its consumption and the relative importance of socio-demographic and economic factors, social norms and reasons for the consumption of bushmeat in urban areas are rarely assessed. The study aims to contribute to the rational use of wildlife with a view to the sustainable management of animal diversity in the Lama Classified Forest in southern Benin. The data collected was obtained after interviews with heads of household and bushmeat sellers following structured questionnaires. Data analysis consisted of placing mixed effects two-level regressions (random intercepts) on a structured sample of 344 people in five towns located around the Lama Classified Forest. The results obtained indicate that the actors involved in the harvesting of bushmeat are poachers. Intermediate actors and distributors of bushmeat are called porters, wholesalers or exporters. With regard to the proportion of the sex aspect in the sale, the woman is mainly represented. Men are more into hunting and transporting bushmeat. A total of 13 species are preferred for consumption. The main driver of bushmeat consumption in households is size and age group. The sources of motivation for the consumption of bushmeat are the taste and the purchase price. The amount of bushmeat consumed over the course of a month is 1 kg on average per household in these towns. Assessing the species harvested and consumed allows decision-makers and managers to target anti-poaching efforts and size the alternatives to be put in place to compete with bushmeat.*

Keywords: *bushmeat, social norms, hunting, natural, Lama Classified Forest.*

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Evaluation of Endoparasitism in Fallow Deer (*Dama dama* L.) from Timis County Hunting Grounds

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Abstract: *The species do not live alone, at the habitat or ecosystem level they form a union, a conglomerate, together with other species between which various relationships or interactions are established. This interaction between two or more species takes various forms: competition, commensalism, mutualism, predation or parasitism. From this point of view, the fallow deer (Dama dama L.) is no exception. In this context, the purpose of the study was to check the possible presence of endoparasites in fallow deer from Timis County and to evaluate the results obtained using classical coprological methods, macroscopic and microscopic examination of the intestinal mass and organs. There were examined 55 fallow deer from two funds hunting from Timis County. The coprological examinations revealed the following results: the presence of morulated strongilid eggs (gastrointestinal nematodes) 43.63%; the presence of Dicrocelium lanceolatum eggs 20%; the presence of Gongylonema spp. 16.36%. Out of 55 animals who have been examined by necropsy we identified gastrointestinal nematodes in 24 fallow deer, the trematode Dicrocelium lanceolatum in 11 fallow deer and Gongylonema spp. in 9 fallow deer. In the conclusion, the identification of different species of trematodes and nematodes in fallow deer through the classic examination methods certifies the importance of the presence of parasitic endofauna with obvious repercussions on the health status of the parasitized host and, equally, with implications in its ecological relationships.*

Keywords: *Dama dama L., endoparasitism, Timis County.*

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Measurable Parameters Study on Red Deer (*Cervus elaphus* L.) Trophies from Romania, in the Context of National and International Hunting Exhibitions

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Abstract: *Trophies, as a result of hunting activity express a series of elements that need to be analyzed, quantified and ranked. Trophies are classified according to objective criteria, with the International Council for Game and Wildlife Conservation developing an evaluation formula whose elements consist of measurements and assessments (Cotta et al 2001). Based on the material presented, hunting exhibitions can generate objective deductions regarding the progress or regression of species, both zonally, regionally and nationally, becoming a vector in the establishment of game protection and extraction activities (Pop 1982). To carry out the study and select the data, the catalogs of all the national and international exhibitions in which Romania participated were consulted. This resulted in a number of 184 data sets, the provenance of the trophies covering 25 counties from the period 1919-2003.*

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Geomatics, informatics, modelling and statistics

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Econometric Model for the Forest Sector

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Abstract: *The econometric model is developed based on statistical analysis and has as variables: the demand for wood, the supply of wood, the internal and external prices of wood, the price of land with forests, forested area and so on. Each equation of the model is tested in terms of validity, as well as each parameter obtained. In addition to these variables, the model also uses time series on the change in wood mass in the last 20 years. The data used are official data from national statistics as well as European Union statistics.*

Based on the model, different scenarios can be performed regarding the variables used. Also, predictions of these variables can be made for periods between 3-5 years.

Also, based on the model, international comparisons can be made to show the different trends in the evolution of the forestry sector.

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Using ICESat-2 Data for the Detection of Changes in Forest Canopy Height

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Abstract: *The Ice, Cloud and Land Elevation Satellite-2 (ICESat-2) is a NASA-coordinated satellite mission which uses a photon-counting altimeter to take measurements of the Earth's surface at an unprecedented spatial (laser pulses are emitted at a frequency of 10kHz, roughly translates into one pulse every 0.7m along ground tracks) and temporal (91-day revisiting window) scale. Although the main focus of the program is cryosphere monitoring, given the near-global coverage of the satellite orbits, data provided by ICESat-2 has been successfully used for the detection of forest canopy and its characteristics, mainly height and density. For this study, two of the ICESat-2 datasets (ATL03 and ATL08) were analyzed in order to evaluate the changes in canopy heights for a forested test area. Given the limited timeframe of ICESat-2 data (the program launched in 2018), comparisons were also carried out with canopy heights extracted from ALS (Airborne Laser Scanning) data collected using a Riegl QMS-560 sensor system over the same area in 2012. Results show that data from ATL08, which provides canopy metrics aggregated over segments of 100 meters, is easy to read and integrate into user workflow, but because of the aggregation carried out by the provider it is not sufficiently detailed for monitoring canopy height below regional or global scales. On the other hand, the ATL03 dataset, which provides raw data per photon, is much more suitable for local analyses. However, the extraction of necessary data from ATL03 involves complex processing steps that require significant resources of memory and computing power.*

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Modelling Forest Ecosystems Services under the Influence of Climate Change and Forest Management

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Abstract: *Forests are a major provider of ecosystem services that are affected fundamentally by climate change as a combination of warming, alteration of precipitation regime, an unpredictable pattern of extreme events, and a changing disturbance regime.*

In this context, the Landclim model was used to analyze the evolution of forest ecosystem services, in a forest district in the northern part of Romania, in mild, moderate, and extreme climate scenarios and contrasting management types.

The provisioning of ecosystem services such as timber production and Carbon storage reacted differently to climate. In our case studies, timber production decreased in moderate and in extreme climate. The decline in potential timber production led to more drought-tolerant species and a lack of more profitable tree species.

The regulating ecosystem services as aboveground Carbon stock is strongly influenced by management intensity, the higher stock being in no management simulations. Even if the lack of management has the advantages of increasing the biomass stock, these can be counteracted by biotic and abiotic disturbances whose frequency and intensity have been increased in no management simulations. Increasing the diversity of tree species can be an appropriate adaptation measure and promotion of drought-tolerant species such as beech.

Therefore, the LandClim model is a solution for assessing the evolution ecosystem services in different climate scenarios and management types. Its results should not be understood as clear indications by forest managers.

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Are Forest Structure Maps based on Field 3D Laser Scanning and Sentinel-2 Vegetation Metrics Suitable for Managing Forests?

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Abstract: *Mapping forest structure variables for large areas requires combining field-based measurements with remotely sensed data. As part of that framework, remote sensing provides proxies that can be used to model forest attributes over large areas at much lower cost than traditional field inventories. However, a large number of field plots are needed to be measured and combined with remotely sensed data. We present here a methodology that combines a Field 3D laser scanning (to determine trees biometric variables) with vegetation metrics from Sentinel-2 to derive native forest structure maps at 10-m spatial resolution. Our study area is located in Romania, where we measured 416 field plots of 1,000 m^2 during the year 2022. Inside each plot, using the mobile scanner with a 3D technology, we collected position, number, diameter, and height of each tree. With further processing based on tree segmentation, we obtained diameter at 1.30 m (DBH), height, trunk shape and volume (m^3) and branches volume (m^3). For each plot we then obtained 4 dependent variables: DBH (cm), basal area (m^2/ha), height (h) and volume (m^3/ha). As independent variables, we calculated 4 vegetation metrics derived from Sentinel-2. We then used random forest regression to model the four forest attributes across the research area. Our predicted forest structure attributes well with and RMSE of 32.4 m^3 for volume. Our methodology yielded reliable predictions of forest structure attributes, providing a strong basis for forest management and conservation planning across Romania.*

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Modelling Trees Physical Properties in Representative Norway Spruce (*Picea abies* (L.) H. Karst) Ecosystems in the North Eastern Carpathians

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Abstract: *Forests have played an important role in the life of our planet, often contributing decisively to the development of human society. One of the most important physical properties of wood is density. It can be correlated with numerous other properties and has an important role for the standing trees as well as for the products resulting from wood processing regardless of species. Another method of determining wood density can also be considered microdrilling resistance, which is classified as a non-destructive method for measuring wood density as well as assessing the internal state and detecting tree defects. The aims of this study were to evaluate the conection between wood density, microdrilling resistance and tree diameter using a linear model and to observe the best candidate model for predicting the standing tree density. The research material comes from four experimental plots and consists of 270 trees (78 trees - control variant, 85 trees - moderate variant and 107 trees - strong variant). Applying generalized linear models showed that, when using covariates of microdrill resistance and tree diameter at breast height, there is a significant influence on the dependent variable, wood density. These results suggest that it is possible to consistently estimate quality and resistance in Norway spruce standing trees using microdrilling method.*

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Using UAV Aerial Imagery for Determining Tree Height and Crown Diameter (case study: Zagros Oak Forests)

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Abstract: *Tree structural parameters (e.g., DBH, tree height, and crown diameter) can be measured in the field based on direct or indirect methods, but field measurements are very time-consuming and costly, especially for large areas and regular monitoring plans. The advent of Unmanned Aerial Vehicles (UAVs), consumer-grade cameras, image processing, and 3D modeling techniques provide new insights and offer solutions to measure individual tree attributes in a timely and accurate manner. Hence, this research aimed to evaluate the potential of UAV images to estimate tree height and crown diameter in a Mediterranean oak forest in Iran. Our methodology was developed based on a sequence of tasks, including UAV image acquisition, point cloud classification, digital terrain model (DTM), digital surface model (DSM), canopy height model (CHM) construction, CHM smoothing, local maximum filtering, and raster segmentation. Also, a field inventory was carried out in the summer of 2020 to measure tree height and crown diameter. Our results confirmed the capability of low-cost UAV images and the used image processing workflow to estimate individual tree height and crown diameter. The approach of estimating the tree height and crown diameter in a mountainous area through the UAV platform would be beneficial for supporting local and regional forest managers in the Oak forests of Iran.*

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Efficiency of Gross Fixed Capital Formation in Forestry – Data Envelopment Analysis Cross-country Comparison in EU

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Abstract: *The problem of the economic efficiency of investments in fixed assets is of constant relevance in forestry. The present study aims to analyze the economic efficiency of these assets in the forestry of European Union countries. The methods used are widely accepted non-parametric approaches that sufficiently reflect the advantages and disadvantages of individual countries in managing forestry fixed assets. The results of DEA and the Malmquist index can be applied in practice.*

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Can Spaceborne and Terrestrial LiDAR Technology Be used to Map the Forest Structure?

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Abstract: *Can spaceborne and terrestrial LiDAR technology be used to map the forest structure? And if so, how can we use the acquired information to help our understanding of biodiversity and ecosystem services or the role of forests as carbon sinks? The need for better and more detailed information on the three-dimensional structure of forest vegetation has been pointed out for decades (Hurtt et al., 2010). This necessity resurfaced in many studies (Arnold, 1988; Bersier & Meyer, 1994; Hall et al., 2011; Hewson et al., 2011), and was underlined in programs such as Reducing Emissions from Deforestation and Forest Degradation (REDD+) (Duncanson et al., 2020; Vaglio Laurin et al., 2014).*

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Effect of Nurse Shrub on Taxonomic and Functional Diversity under Different Grazing Intensities and Climate Regimes

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Abstract: *Plant-plant interactions strongly affect plant biodiversity especially in severe ecosystems. Although there are a wide range of studies on impacts of nurse species, we little know about how shrub species manage plant biodiversity. Therefore, we quantified taxonomic and functional diversity beneath shrub Artemisia Kopetdaghensis canopies and in compared to paired open areas across different climate and grazing intensities. Taxonomic and functional diversity were measured using RaoQ and mean pairwise distance (MPD) indices, respectively. We also measured diversity of five functional traits including plant height, specific leaf area (SLA), seed mass, coloniality and life form using community-weighted mean (CWM) index. Our findings indicated an increase in taxonomic and functional diversity across climate and grazing intensities, when considering nurse shrub than their open interspaces. Such increase was more positive and stronger in arid region and low grazing intensities for taxonomic diversity, while it was more robust for functional diversity under arid region and under high grazing intensity. CWM values of life form and SLA traits were higher under arid region and high grazing intensity, whereas a considerable decrease was found for these traits under semi-arid region and low grazing intensity with respect to presence of nurse shrub. We conclude that presence of nurse shrub significantly harbor loss of taxonomic and functional diversity under severe conditions, and would consider as a paramount factor in managing wildlands, where face disturbances. It seems that nurse shrub by providing specific mechanisms influence plant biodiversity. These mechanisms are related to control beneficiary diversity through competition and facilitation processes.*

Keywords: *Nurse shrub, Functional diversity, Taxonomic diversity, Ecological functional traits, Grazing intensity, Climatic regimes.*

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Spatio-Temporal Monitoring of Meteorological Drought Using the SPI Index

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Abstract: *Drought is one of the most harmful natural disasters. The occurrence of this phenomenon is more than other natural disasters. In this study, 102 annual rainfall stations were used in Fars Province, southwest Iran, during a 20-year statistical period (1999-2019). The mean annual temperature is 16.8 ˚C and the winter and summer mean temperaturea are 4.7 ˚C and 29.2 ˚C, respectively. The mean annual rainfall various from 200 to 1200 mm/year. Fars province includes three climatic regions: (1) north and northwest mountainous areas with mild summers and relatively cold winters, (2) central area with hot and dry summers and mild and rainy winters, and (3) southeast regions and southern areas with cold winters and hot summers. The SPI (Standardized Precipitation Index) index was used to monitor meteorological drought. So, SPI values were calculated for each station with regard to the annual precipitation, and the drought situation was determined in a period of 12 months. After calculation of SPI, spatial changes of meteorological drought were evaluated by inverse distance weighting (IDW) interpolation method. Monitoring of SPI values in the study area shows that the highest and the lowest values differ from 4.76 (in 2014) to -1.97 (in 2019). This finding indicates that a clear trend in terms of positive SPI values and subsequently humid conditions is generally seen in the northeast of the province in all years, although the central part of the province and somewhat inclined to the south has wetter conditions in 2016 when compared to other years.*

Keywords: *Drought, inverse distance weighting, Standardized Precipitation Index, Iran.*

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FACULTY OF SILVICULTURE AND FOREST ENGINEERING

An Integrated Assessment and Monitoring Framework for Effective Forestlands Governance and Sustainable Management of Forest Resources

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Abtract: *Assessment and long-term monitoring of forests and their resources is critical for their sustainable management. Greece lacks a modern consistent and digital National Forest Inventory system that allows systematic and periodic monitoring of forest resources. Existing forest management plans are designed mainly for productive forests and actually are not up-to-date. Large areas of transitional woodlands and degraded forestlands remain unmanaged. The need for a scientific-based consistent long-term integrated assessment and monitoring system for forests and their resources is urgent. This article reviews the current institutional and policy setting regarding forestlands administration and management, and presents a methodology for monitoring forests using satellite-based (Sentinel-2) and Very High Resolution (VHR) airborne imagery. The innovative approach integrates multiple data sources of different spatial scales using existing geospatial data (Forest Maps, Natura2000 habitats, cadastral parcels and LPIS). Resource information (species, density, land use/land cover, ownership, etc.) is recorded at the sub-stand level in forests under management regime and in unmanaged forestlands as well. This study provides a solid prospect for the development of a modern National Forest Inventory to support both effective land administration and sustainable management of forests with multiple objectives such as biodiversity, conservation, protection and timber production.*

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Monitoring the Influence of Urban and Peri-Urban Forest to Air Quality in Brasov Area using Sentinel 5 Satellite Data

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Abstract: *One of the most urgent environmental issues facing both industrialized and emerging nations is atmospheric pollution. At all levels, from local to national, the production of energy using fossil fuels and traffic are significant public health problems. Major contributors to atmospheric carbon monoxide (CO) include incomplete combustion of fossil fuels, burning of biomass, and the oxidation of methane and non-methane hydrocarbons, which is predominantly triggered by the hydroxyl radical (OH). Nitrogen Dioxide (NO_2) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NO_x).*

Globally, air pollution contributes to 11.65% of people's mortality rate. In Nepal the influences of air pollution to deaths are raising up to 23.13%. Romania's percentage is lower, 6.32%, but this does not necessarily mean things are improving.

The urban forests of Europe have been under a constant strain from society. The ongoing process of urbanization has resulted in increased pressure on existing forests for recreational purposes, as well as a shift away from forestry in favor of other land uses and rising demand for new (urban) forests. Major contributors to atmospheric carbon monoxide (CO) include incomplete combustion of fossil fuels, burning of biomass, and the oxidation of methane and non-methane hydrocarbons, which is predominantly triggered by the hydroxyl radical (OH). Studying the air quality is easier nowadays due to satellite images and air quality indexes.

For measuring the air quality, it can be used Air Quality Index and TROPOMI data, the latter is available on the Google Earth Engine motor. Onboard this new Earth Observation platform, data from the TROPOMI spectrometric sensor utilized for investigations of tropospheric complex pollution have already been simulated, evaluated, and confirmed by authors, focusing on a number of topics.

Forests are clearly such a varied resource that can improve people's quality of life in so many ways. In the city, with vegetation of any kind being quite sparse, creating an oasis, such as an urban forest, can raise people's comfort level by improving air quality, social, educational and other activities. Every city that does not have a natural forest that can be framed as an urban forest, like Brasov, can take the first step to give life to one.

Keywords: *air pollution, urban forest, TROPOMI, AQI.*

Transilvania University of Brasov
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Flow Diagram of Wood Supply Chain from Romsilva

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Abstract: *The current energy crisis felt more and more strongly at European level brings to the fore the need to manage and use as efficiently as possible the wood resource used for both electricity and heat generation and industrial processing. In this context, this study aims to map the harvesting and valorization activity of wood of the main wood supplier in Romania - National Forest Administration - Romsilva (RNP), to identify opportunities for optimization and efficiency of the wood supply chain, using the business process analysis method and the language of BPMN. The mapping of the wood harvesting and exploitation process was carried out based on interviews with specialists and representatives of the actors involved in the process, identifying the activities carried out, their succession, stakeholders, intra- and inter-organizational interactions, as well as the legal and procedural provisions governing the respective activities. The results revealed the multitude of activities carried out, a prescriptive legislative framework with direct influence in the excessive bureaucratization of the process, a low level of digitization and use of electronic communication channels, centralization of decisions, cumbersome interinstitutional communication, unpredictability of supply, long lead times for the procurement of operating services with implications for reducing the volume of wood placed on the market. Based on the results obtained, some important directions have already been identified which by remodeling the harvesting and exploitation process of wood can lead to its optimization and efficiency: simplification and flexibility of the legislative framework, use of business process modeling methods to analyze and optimize RNP management, modification of internal procedures of RNP, implementation of an integrated it system.*

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Mapping Species and Habitats in Protected Areas. A Study Case of the Natural Park Bucegi Mts., Romania

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Abstract: *An effective management of protected areas requires, first of all, a good knowledge of species and habitats distribution. In the case of a large and heavily accessible territory, as the Natural Park Bucegi Mts., the available maps usually don't display information for those rare species and vegetation types with small and fragmented areas or ephemeral development. The aim of the present study was to provide identification criteria and an easy-to-use methodology for mapping species and habitats. As input data were used field inventories and literature records, freely available layers (DEM, geology, river network, land cover). The climate parameters were derived locally, at higher resolution than World-Clim maps. The intermediate outputs were maps for potential incoming solar radiation, temperature, evapotranspiration, relief types, and soil moisture. The final products included species/habitat suitability (potential distribution), connectivity maps. The analysis was done in QGIS, Saga Gis and Connefor. It was tested for two plant species (Ligularia sibirica and Tozzia carpathica) and two Natura 2000 habitats (9150 Medio-European limestone beech forests of Cephalanthero-Fagion, 9180 Tilio-Acerion forests of slopes, screes and ravines). The main outcome of this study is a practical guideline in the field of nature conservation management that allows non-experts GIS users to prepare supporting maps for efficient surveys, assessment of species and habitats connectivity and precise planning of management measures.*

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Variability of Pedunculate Oak (*Quercus robur* L.) Based on Morphological Parameters

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Abstract: *Pedunculate oak (Quercus robur L.) is one of the most important tree species in European forests. Climate change has been supposed to negatively affect pedunculate oak forests, particularly in the region of Southern Europe. Drought has been frequently described as the principal abiotic stress factor that alters hydrological regimes in these ecosystems. Leaf morphology depends on genetic information and environmental condition. Also, leaf morphology has an important impact on leaf gas exchange, especially on photosynthesis. Hence, leaf structures are important from the aspect of biomass production. The objective of this study was to determine the genotype variability of leaf morphological properties in the natural population. For the purposes of this research, twenty-one morphological parameters were used. Leaves were sampled from ten genotypes from the natural pedunculate oak forest in Morović which grew under the same environmental conditions. . Intarpopulation variability was confirmed by the results of the analysis of variance (ANOVA). A statistically significant ($p < 0.05$) effect of the population was obtained for most of the studied morphological characters. Seventeen parameters showed statistically significant variability. The highest variability was estimated for the ratio of the petiole length and total lamina length (79.59%), and petiole length (60.32%), while the lowest variability was estimated for the percentage of the veins (16.94%). These quantitative differences between studied parameters are the consequence of interaction genotypes and common environmental conditions.*

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Digital Terrain Model Extraction from Leaf-Off UAV Images in a Dense Broadleaved Mixed Forest

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Abstract: *Digital Terrain Model (DTM) is widely used for sophisticated forest inventory applications such as logging routes identification, forest roads detection, construction canopy height model, and individual tree measurements. The most effective remote sensing data for DTM construction in dense forests are typically airborne laser scanning (ALS). However, repeat surveys utilizing ALS are not feasible due to cost limitations. Therefore, using Unmanned Aerial Vehicles (UAVs) image-based point clouds can be an alternative approach. But, when areas with dense canopy cover are observed from above, bare ground is often partially or fully obscured by the vegetation layer, making it difficult to observe it and construct an accurate DTM. In this study, we aimed to use leaf-off UAV images as an alternative approach for DTM generation in a dense forest (northern Iran). In this regard, one successful flight was carried out in leaf-off season using a UAV, equipped with a GNSS, IMU, and an RGB camera. After that, a photogrammetric processing technique was applied to the UAV images to construct dense point clouds. Next, the dense point clouds were classified into two classes: ground points and the rest. Finally, we used the ground points and interpolation method to generate a very high-resolution (VHR) DTM. For accuracy assessment, we used 47 ground control points (GSP), which were recorded using differential Trimble R3 GPS. Statistical analysis of measured and estimated elevation values confirmed the potential of leaf-off UAV images and the used methodology in the construction of a VHR DTM from dense broadleaved mixed forests.*

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Long Term Forest Dinamics from Valea Dambovitei

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Abstract: *Sustainably maintaining multifunctional forest ecosystems has become a widespread objective of forest management (Manning et al. 2018; Schmithusen 2008). The forest management activity is the main human intervention that for centuries shaped the forest with the aim of maintaining the balance between forest changes and other ecosystem services such as supporting (nutrient cycling, water cycling, soil formation), regulating (purification of water and air, carbon sequestration and climate regulation), cultural (cultural, recreation experiences, science and education) and provisioning (food, fuel wood, medicinal resources). Our goal was to identify the disturbance in forest structure in Valea Dambovitei by combining remote sensing analysis and the data taken from management plans.*

We created a historical database of the forest from Valea Dambovitei, starting from 1950 until now. The acquisition of data was done by georeferencing the forest management maps and vectorizing the forest plots and attaching the descriptive data taken from management plans. We perform an analysis of the works that were done over three periods. In order to extract the disturbance from satellite images, the automatic extraction of the forest pixels was carried out based on the histogram and the supervised classification of the satellite images. (Potapov P.V. et al., 2015, Hansen M.C. et al., 2013) after running the obtain images were classified into areas covered by forests and areas without.

In disturbance analysis we discover that none of the two methods ensure obtaining accurate result. The data from management plans are registered at the forest plot level; we do not know the affected area or the spatial location. In the satellite analysis we discovered that the low intensity forest works cannot be identified and distinguished.

Our research provides that a comprehensive analysis must use data soucers, the data from satellite images to achieve a spatial localization of the affected areas and the data taken from the management plans to identify all tips of forest works. The two data sources are reliable togheter because we have situations when we do not have access to the management plans , but the disturbances can be seen from the satellite images, and also there are situations when they are not visible from the satellite, but there are recorded in the management plans.

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The Use of Geographic Information Systems in Solving the Problems of Retrocession of Lands with Forest Use

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Abstract: *Although it has been so long since the property laws appeared that try to repair at least some of the injustices committed during the communist regime, there are still many situations in which they cannot manifest their effects. There are many causes that led to this undesirable situation, perhaps the biggest of them being the impossibility of harmonizing the technical part with the legal one. In the framework of this work, an area was studied that includes forests that must be returned to the former owners from Brasov county, with an area of several hundred hectares, for which parcel plans are drawn up in order to forward them to OCPI Brasov to be approved (this being the only way by which a land deed can be drawn up for a building with forest use). The opportunities that the GIS provides to the user in order to enter the land data in the forestry project, to compare/verify with the forestry plotter and to signal problem situations were highlighted.*

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Assessment of the Norway Spruce Standing Trees dEnsity by Non-Destructive Methods in Relation to Tending Forestry Works

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Abstract: *The aims of the presentation, were to evaluated the usefulness of the Resistograph for assess standing-tree wood density by microdrilling and for estimating individual-tree breeding values developed in tending forestry work carried out on Norway spruce stands by examining relationships between the Resistograph readings and volumetric wood density. This study was conducted in four experimental plots where were applied different tending forestry work variants (control, moderate, strong) in the northern Carpathian Mountains. Data used in this study were collected from 270 Norway spruce trees. It was made by: measuring the wood with decay resistance using IML RESI PD device; evaluate the density of the wood by volumetric method; respectively assess the density of wood of Norway spruce trees using drill resistance developed in tending forestry work carried out on Norway spruce stands. The following indicators were quantified: the relationship between density and microdrilling resistance; evaluate the model performances of candidate models for predicting wood density based on different predictors; and estimate the parameter of the best candidate model for assess standing-tree wood density by microdrilling. Linear regression models and generalized linear models were used to examine the relationships between wood density and amplitude of microdrilling resistance. The relationship between the density and the resistance to microdrilling is given by a linear regression. Generalized linear models used show that when using the covariates microdrill resistance and DBH there is a significant influence on the dependent variable, wood density, for all work variant.*

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Conifer Tree Species Habitats in Siberia under Current and Future Climate

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Abstract: *Species composition of the Siberian forests dominated by conifer trees is changing rapidly due to logging, fires, invasive insects and phytopathogens. Conifer forests are also subject to current climate change. Our goals were to evaluate potential conifer forest-forming tree species habitats in Siberia under current and future climate to plan adaptation and conservation measures for these species and forests. We used our Siberian bioclimatic models: SiBCliMTree that simulates major forest-forming tree species distributions. This model is of static envelope-type that predicts tree species from three bioclimatic indices characterizing warmth, cold, and moisture conditions: growing degree days, negative degree days, and annual moisture index. Additionally to climatic indices, models included permafrost, a critical ecosystem determinant in Siberia occurring on 80% of Siberia. Coupling our bioclimatic model with the climatic indices and the permafrost distributions we predicted potential distribution of forest-forming tree species in current and the 2080s climates. Climatic anomalies by 2050s were derived from a CMIP6 climate model ensemble for two climate change scenarios: the ssp126 and ssp585 reflecting the smallest and the largest temperature increase correspondingly. Conifer species ranges and diversity were projected by the end of the 21st century over Siberia.*

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