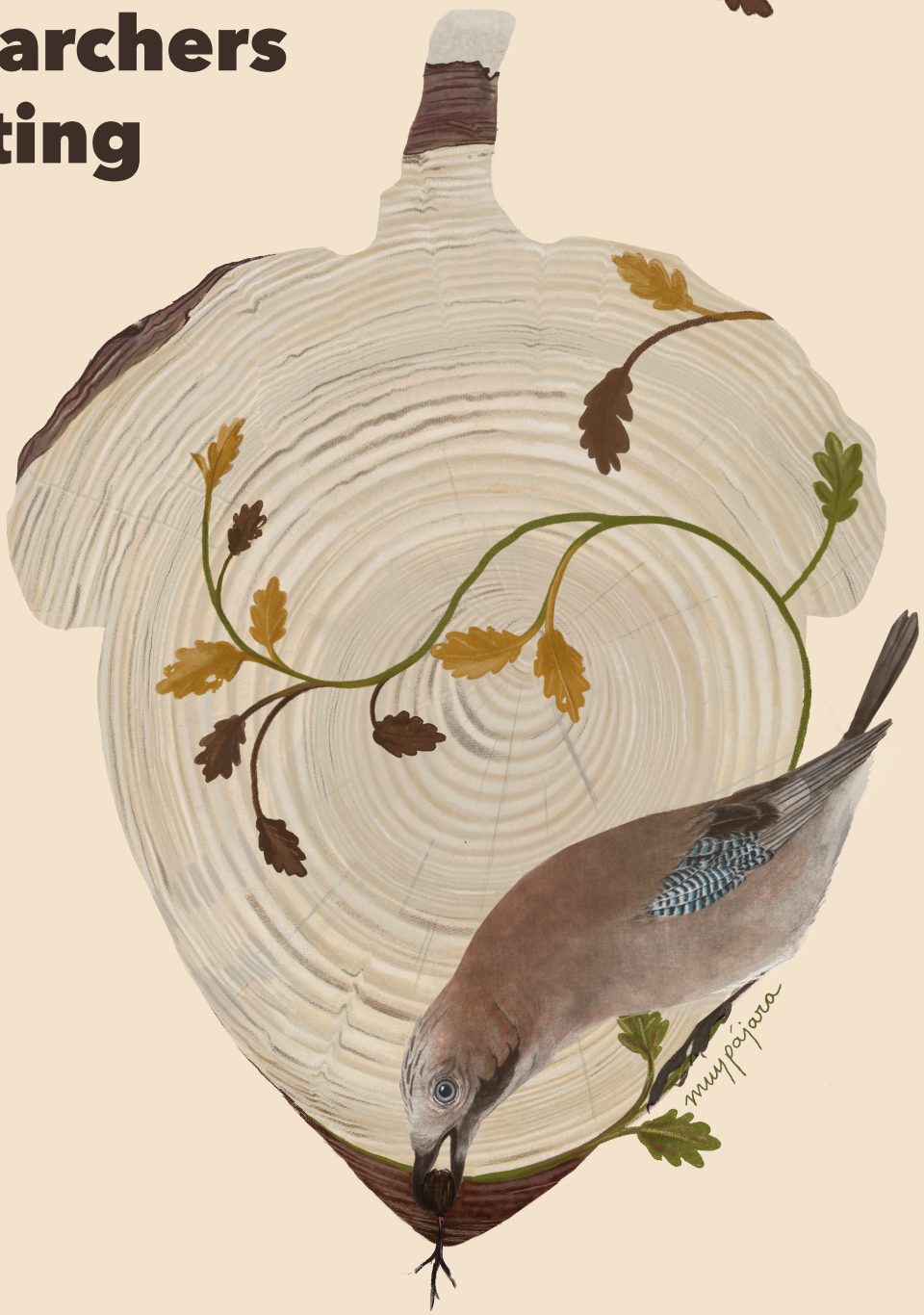
XX Annual Young Foresters Researchers Meeting



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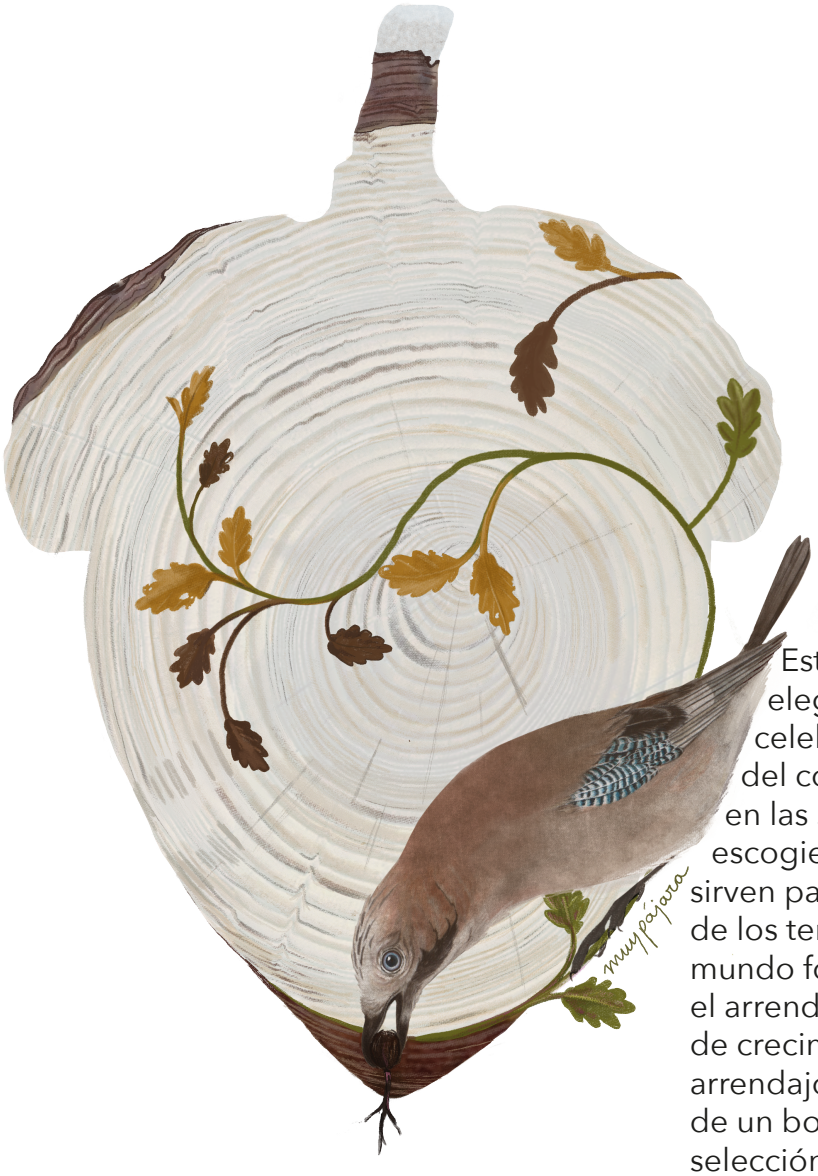
28.01 - 29.01

Palencia



Logo YF

Este es el diseño que fue elegido especialmente para celebrar el 18º aniversario del congreso y que perdura en las siguientes ediciones. se escogieron tres imágenes que sirven para representar algunos de los temas de interés en el mundo forestal. Concretamente, el arrendajo, la bellota y los anillos de crecimiento de los árboles. El arrendajo representa el nacimiento de un bosque por su labor de selección, recolección y plantación

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ISBN: 978-84-09-85783-8

ÍNDICE

PREFACE

Once again, and on behalf of the Organization Committee, I am proud to present you the Abstracts Book of our XX edition, held in Palencia on 28st and 29st of January 2026.

This Young Forest Researchers Meeting started at Palencia in 2007 as a short meeting with some 20 participants, our PhD students at that moment. The goals were, and still are, three: 1) to show and discuss on our research in all the different aspects of Forest Sciences in a relaxed and friendly environment; 2) to give to our masters, doctoral and young postdoctoral fellows the possibility and training related to scientific communication at all levels, using and perfectioning their oral, graphic and written skills; and 3) to serve as a public platform of cohesion and visibility of our institute. Our strength depends on our capacities of response to important questions in Forestry.

Along the years we have adapted to new situations: more posters to held more than 100 participants every year; shorter speeches; shift to English, Abstracts Book with ISBN, and more open and international meeting. But we have always maintained our goals: research, training and networking, and our identity signs: the youth of most of the participants, as they are the main target audience; and our international character.

Many people from more than 60 countries have participated in these 20 editions showing their work in talks or posters, many of them have participated in the organization of the meeting through different responsibilities as chairpersons, or invited speakers, and all of them contributed to make this Meeting a reference for Forest Research. Welcome to this fruitful XX edition of our meeting and enjoy! NOTA: If you lost part of the meeting presentations, you can find all of them together with a short video at https://www.youtube.com/watch?v=vrFhMwlDVNg&list=PLsdzTKpJZZa7J_UcDH6wE18Qnl8TePu5S

Jonatan Niño Sánchez
Coordinator of the Organization Committee

PROGRAMME

WENESDAY 28th JANUARY

09:00-10:00 REGISTRATION
Posters will be placed on January 28th at the moment of registration

10:00-11:15 SESSION I
Chairpersons: María de la Encarnación Coca García ; Saioa Munuera Irurzun
Participants:
Gonfa Kewessa, Herminia Alonso, Clara Cámara, Juan de María Arnaiz, Juan Manuel Giraldo, Manuel Gomez, Liszeth Ojeda, Jorge V. Maurice

11:15-11:45 COFFE BREAK
11:45-12:15 OPENING SESSION

Academic & Local Authorities:
- **D. Felipe Bravo Oviedo,** Director del iuFOR
- **Dña. Miriam Andrés Prieto,** Alcaldesa de Palencia
- **D.Óscar Santamaría,** Subdirector de Proyectos, Investigación y Calidad ETSIIAA
- **Dña. Blanca Ares González,** Directora General de Universidades e Investigación

12:15-13:45 KEYNOTE SPEAKER & ROUNDTABLE:

HANS PRETZSCH
TUM (Technical University of Munich)

"Using diversification of structure and species as a nature-based solution for forest stand management"

Roundtable Participants:
- **HANS PRETZSCH,** TUM (Technical University of Munich)
- **Felipe Bravo Oviedo** (iuFOR-UVa)
- **Miren del Río,** Instituto de Ciencias Forestales (ICIFOR-INIA)
- **Miguel García Hidalgo,** (iuFOR-UVa)

13:45-14:00 MEETING GROUP PICTURE

14:00-16:00 LUNCH (University Cafeteria)

16:00-17:15 SESSION II
Chairpersons: María González Granados ; Eric Cudjoe
Participants:
Alba Magarzo, Alicia Xu Díez, Carlota López, Nikolay Ivanov, Jorge Maestre, Saioa Munuera, Rodrigo García

17:15-18:15 POSTER SESSION + COFFEE BREAK

18:15-19:30 SESSION III
Chairpersons: Clara Cámara Pérez ; Manuel Gomez-Roux
Participants:
Andrés de la Cámara, Ashma Thamri, Diego Álvarez, Endika Blanco, Laura Daniela García, María González, Marina Martínez, Titly Kaiyum Talukder

19:45 COLD DINNER (University Cafeteria)

THURSDAY 29st JANUARY

09:15-10:30 SESSION IV
Chairpersons: Andrea Fadón Alberca; Gonfa Kewessa Hunde
Participants:
Aman Oli, Eric Cudjoe, Jorge Ortiz, José Cipra, Lucía Alonso, Sophia Pruden, Tiara Zimmermann, Manuel Crespo

10:30-11:30 POSTER SESSION + COFFEE BREAK

11:30-12:45 SESSION V
Chairpersons: Herminia Alonso Zaldívar ; José Alberto Cipra Rodríguez
Participants:
Franklin Riera, Ana de Torre, Girma Nigussie, Natalia Crespo, Samran Shaukat, Tamiru Lemi Kebede, Encarnación Coca García, Muhammad Awais Naveed

13:00-14:00 CLOSING SESSION & DIPLOMAS DELIVERY

Academic and Research authorities:
- **D. José Ramón González,** Director de la EsDUVa
- **D. Felipe Bravo Oviedo,** Director del iuFOR
- **D. Luis Miguel Cárcel Cárcel,** Director de la ETSIIAA
- **D. Julio Javier Díez Casero,** Vicerrector del Campus de Palencia

14:00-16:00 LUNCH (University Cafeteria)

SESSION I

WHAT FOREST PROXIMITY TEACHES US: LOCAL KNOWLEDGE AND PERCEIVED FOREST ECOSYSTEM SERVICE IN CENTRAL ETHIOPIA

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Keywords: Local knowledge; Forest services; Community perceptions; Distance to forest; Afromontane forests; Forest management; Ethiopia

Local communities living near forests carry rich ecological knowledge that shapes how they perceive environmental change. Yet in Ethiopia's dry Afromontane forests, we know little about how this knowledge differs across space or socio-economic groups. Understanding these differences is crucial for practitioners who aim to design inclusive, adaptive approaches to forest governance. This study explores how people living at varying distances from the Menagesha Suba Forest perceive forest change, climate variability, and the availability of forest ecosystem services (FES). Using a mixed-methods approach, we surveyed 194 households located inside, at the forest boundary, and outside the forest, and complemented this with focus group discussions and interviews with key informants. The analysis combined social surveys with multivariate and regression techniques, including PERMANOVA, non-metric multidimensional scaling, and ordinal regression. Our results show clear spatial patterns in how FES are perceived. Proximity to the forest significantly (R^2 = 0.106, p = 0.001) influenced perceived availability of provisioning services, while wealth and household characteristics explained important differences in knowledge and dependence on the forest. More than 80% of participants reported declines in forest cover and FES flows over the past two decades, mainly due to agricultural expansion, grazing, and fuelwood extraction. Despite these pressures, communities expressed a strong willingness to engage in conservation, emphasizing reforestation, community-based forest management, and locally grounded climate adaptation. This study highlights how integrating local ecological knowledge with spatial and social analysis not only strengthens forest governance but also equips people with practical skills for evidence-based, people-centered forest management.

DEHESAS OF POLLARDED OAK TREES AS A WINDOW INTO SARDINIA´S PAST CLIMATE.

Clara Cámara Pérez*[1], Gabriel Sanguesa Barreda[1], Gianluca Piovesan[2], Michele Puxeddu[3], José Miguel Olano Mendoza[1].

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Keywords: Dendrochronology, climate reconstructions, pollarded oak trees, Cerdeña, Mediterranean climate.

Dendrochronology is an essential tool for reconstructing past climatic conditions. However, most long chronologies come from old trees located in mountain areas that are difficult to access and have low human influence, which limits our ability to obtain representative climate reconstructions for lowland areas. This lack of data is particularly relevant in the Mediterranean basin, a region characterized by high biodiversity and population density, subject to complex atmospheric influences and high variability in precipitation. In this context, pollarded oak trees represent an exceptional opportunity. This traditional management system, based on the periodic removal of branches from the tree, has allowed very long-lived individuals to survive in intensely transformed landscapes, constituting one of the few reservoirs of ancient trees in Europe. Despite the gradual abandonment of the practice, these trees offer a valuable archive for climate reconstructions in lowland areas. On the island of Sardinia, although previous dendrochronological studies exist, the available information focuses on specific species or locations, mainly linked to studies on drought, ecophysiology, and forest management, with chronologies limited to recent decades. There are no extensive climate reconstructions covering past centuries. Therefore, this first phase of the project focuses on identifying and dating long-lived trees on the island in order to evaluate their climate signal and their potential for future reconstructions. This approach will expand dendroclimatic knowledge of Sardinia and contribute to a more accurate characterization of the Mediterranean climate in low-altitude areas.

DENDROCHRONOLOGICAL METHODS APPLIED TO ANDEAN SPECIES USED IN ECOLOGICAL RESTORATION

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Keywords: tree rings, andean forest, wood anatomy, biomass, Quercus humboldtii

Soil degradation is one of the biggest concerns in relation to agriculture and food The tropical Andes constitute a global biodiversity hotspot, with ecosystems of high ecological value, but subjected to intense historical pressures from deforestation. Active restoration of these ecosystems is a priority to ensure their recovery and the provision of ecosystem goods and services. In this context, the program Más Bosques para Medellín began in 2010 the restoration of Andean montane forests in the rural areas of the Medellín District, through the establishment of mixed plantations with native species. After 13 years, destructive sampling was carried out to adjust aboveground biomass (AGB) equations. From this sampling, four discs of Quercus humboldtii were collected in addition with ten other core samples. Twenty core samples for the species Cedrela montana and Juglans neotropica were also taken. The objective was to use dendrochronological techniques to analyze the temporal dynamics of diameter growth and AGB accumulation of the three species and finally compare these results with those obtained through permanent plots. Samples from four trees of average basal area per species were selected. These were processed using standard dendrochronological techniques. Their anatomy and ring periodicity were characterized. The number of rings matched the number of years elapsed (13–14 years), which allowed reconstructing growth and AGB trajectories over time. Q. humboldtii stands out as a species without previous records of periodic rings, for which a first approach to its development was obtained. The derived equations showed high precision and similarity with plot estimates (at 13 years: ~100 kg with dendrochronology versus ~140 kg with plots), in addition to advantages in temporal terms and accuracy in diameter measurement. These findings demonstrate the applicability of dendrochronological techniques to estimate functional attributes in restoration processes, providing key information on growth trajectories and biomass accumulation in Andean species, which strengthens forest management and the recovery of degraded ecosystems.

GENETIC DIVERSITY OF WILD POTATO RELATIVES FROM ECUADOR

Liszeth Ojeda[1,2], Álvaro Monteros-Altamirano[3], Xavier Cuesta[3], Eduardo Morillo[3], Mariela Aponte[4]

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Keywords: Genetic diversity, Microsatellites, Wild species

Ecuador hosts a vast diversity of wild potato relatives within its continental territory, many of which have been collected and preserved ex situ by the Germplasm Bank of the National Institute for Agricultural Research (INIAP) of Ecuador. This study aimed to analyze the genetic diversity of 91 accessions belonging to eight wild potato species (Solanum acaule Bitter, Solanum albornozii Correll, Solanum albicans, Solanum andreanum Baker, Solanum colombianum Dunal, Solanum chomatophilum Bitter, Solanum chilliasense Ochoa y Solanum minutifoliolum Correll). Molecular characterization was conducted using 20 polymorphic microsatellite markers (SSRs) from S. tuberosum with M13 Tailing technology. Genetic diversity was estimated by calculating observed and expected heterozygosity, polymorphic information content (PIC), and genetic distances using Bruvo's model.
The results showed that 19 of the 20 evaluated SSRs were highly informative, detecting a total of 159 alleles with PIC values ranging from 0,270 y 0,833. Phylogenetic analysis produced a dendrogram revealing ten clades (C1-C10) categorized into three main groups: Group I, comprising the improved varieties: INIAP-CIP-Libertad, Superchola and Diacol Capiro alongside S. acaule; these belong to the primary gene pool and may form part of a closely related species complex, potentially due to domestication processes or the integration of wild species into breeding programs. Group II consisted mostly of S. colombianum accessions, along with S. albornozii, S. andreanum, S. chomatophilum and S. minutifoliolum. Group III was characterized by a mixture of all species, with a predominance of S. minutifoliolum, S. albornozii, S. chilliasense and S. andreanum. The structure of these last two groups highlights significant genetic variability, likely driven by gene flow and natural hybridization processes between species.

Acknowledgments:
To the "Biodiversity for Opportunities, Livelihoods and Development" (BOLD) initiative. To the International Potato Center, through the BOLD project: "CWR-derived potatoes integrated in breeding pipelines for climate change resilience of farming communities of Cuba, Ecuador, Kenya, and Peru."

DYNAMICS OF SESSILE OAK REGENERATION ALONG A FOREST–MINE GRADIENT: THE FACILITATING ROLE OF SHRUBS

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Keywords: Quercus petraea, nurse-species, coal-mine reclamation, survival and growth, Sub-Mediterranean environment

Restoring native forests in disturbed landscapes is a key ecological challenge that depends on identifying suitable microsites for the establishment and growth of tree seedlings. To investigate this process, the natural expansion of sessile oak (Quercus petraea (Matt.) Liebl.) forests was monitored over 14 years in a 33-year-old reclaimed open-cast coal mine located in the sub-humid Mediterranean region of northern Palencia, Spain.
Three distinct environments –the surrounding forest, the mine edge, and the mine centre– with two different exposures –sunny and shady– were compared in terms of seedling survival, growth, density, and recruitment. Our results indicated that progression from the forest to the mine centre was associated with a reduction in seedling density. Conversely, shrubs became increasingly crucial for Q. petraea seedling establishment in the more stressful mine environments. Although seedling survival declined over time across all environments, overall density was maintained by annual recruitment of new seedlings, mainly in the masting years 2015 and 2020. Seedling survival, annual growth, and height were all greater in mine sites compared to the forest. In addition, height and density were also greater in sunny exposures.
Thus, this study demonstrates the shrubs' facilitative role in the establishment of late-successional Quercus species by enhancing microenvironmental heterogeneity across the mine as stress conditions increase. The successful colonization patterns and positive nurse effect of shrubs underscore their potential as ecosystem engineers and as an alternative natural restoration method for future approaches.
Funding: MICIU/AEI/10.13039/501100011033/FEDER-EU Project; UVa-Predoctoral contracts PREP2022-000580 and 113–2019PREUVA27; and post-doctoral UVa-María-Zambrano (CONVREC-2021–11) contract with funds from the EU–NextGenerationEU program.

ADULT ATLANTIC SALMON (SALMO SALAR, L. 1758) PRE AND POS-TREPRODUCTIVE MOVEMENTS IN THE SOUTHERN LIMIT OF ITS NATURAL DISTRIBUTION RANGE. A CASE STUDY USING RADIO-TELEMETRY IN THE BIDAOSA RIVER BASIN (SPAIN).

de María Arnaiz, Juan[1]; Bravo Córdoba, Francisco Javier[2]; Sanz Ronda, Francisco Javier[3]; García Vega, Ana[4]; Martínez Miguel, Marina[5]; Fuentes Pérez, Juan Francisco[6].
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Keywords: River fragmentation, Hydropower infrastructure, Fish passage efficiency, Migration delay

This study investigates the migratory behaviour and survival of adult Atlantic salmon in the Bidasoa River, located at the southern edge of the species' natural range. Using radio-telemetry, 133 individuals were tracked between 2018 and 2023 to analyze both upstream migration towards spawning grounds and downstream post-reproductive migration, with a focus on the impacts of river infrastructure. Results indicate that while most adults eventually reach spawning areas, their upstream migration is significantly delayed by the presence of dams and associated fish passage structures. Downstream migration, however, poses an even more critical bottleneck: approximately two-thirds of post-spawners (kelts) initiate downstream movement, of which 95.4% perish before reaching the sea. A significant cause of mortality is entrapment in hydroelectric diversion canals, where 24% of descending kelts die from starvation after failing to pass through turbines or return to the main river. Moreover, downstream migration delay in dams is also important and increase mortality. The presence of six hydroelectric plants along the main stem exacerbates cumulative mortality, particularly for larger individuals barred from safe passage by intake screens. These findings underscore the severe ecological barriers imposed by hydropower infrastructure in fragmented river systems and highlight the urgent need for improved upstream and downstream passage solutions to conserve salmon populations at their distributional limits.

LEVEL TERRACES IMPROVE THE GENERATION OF FUNGAL NICHES AND MODIFY FUNGAL COMMUNITIES UNDER POST-MEGAFIRE CONDITIONS

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Keywords:Megafire, ecosystem recovery, soil management, soil mycobiome.

Historical soil management through the construction of level terraces in the mid 20th century remains controversial due to its short term negative impacts. However, its long term role in ecosystem recovery after extreme disturbances such as mega fires is still unknown. This study evaluated the effect of abandoned level terraces on soil fungal communities following the Losacio mega fire in 2022 (>31,000 ha) in the Sierra de la Culebra, Spain. We compared soil properties, vegetation cover, and fungal communities (via ITS1 metabarcoding) between terraced and non terraced plots. Terraces significantly modified key edaphic conditions, increasing soil pH (5.49 vs. 4.99) and herbaceous cover (30.4% vs. 7.7%), while decreasing the C/N ratio (19.9 vs. 26.9). Fungal richness and diversity were not significantly altered, but community composition changed substantially (PERMANOVA: $R^2 = 0.14$, $p = 0.001$). Of 145 indicator genera, 50 were exclusive to terraced plots, including arbuscular mycorrhizal fungi Acaulospora and Ambispora, as well as pyrophilous saprotrophic genera Pyronema and Holtermanniella. Saprotrophic fungi were the dominant trophic guild, with litter saprotrophs being twice as abundant in terraced soils. Soil pH, nitrogen, potassium, C/N ratio, and herbaceous cover were significantly correlated with fungal community structure. Structural equation models indicated that terracing indirectly influenced fungal diversity and guild composition through its positive effects on herbaceous cover and soil chemistry. Our findings suggest that historical terracing creates microhabitats acting as “nutrient islands,” fostering fungal niches and functional groups crucial for post fire recovery. This highlights the potential value of these inherited infrastructures as a climate adaptation strategy, deserving consideration in the restoration of Mediterranean landscapes increasingly affected by mega fires.

SESSION II

BACTERIAL FACILITATION OF EARLY MYCORRHIZA FORMATION IN BLACK TRUFFLE SEEDLINGS

Magarzo, A. [1,2,*], Franco-Manchón, I. [2], López-Ayúcar, S. [2], Olaizola, J.1, [2], Hernández-Rodríguez, M.[1,2], Martín-Pinto, P. [1] & Mediavilla, O. [1]

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Keywords: Tuber melanosporum, mycorrhization, Quercus ilex, nursery plants

The fruiting bodies of the ectomycorrhizal fungus Tuber melanosporum, known as black truffles, hold substantial economic and ecological relevance. This fungus lives in symbiosis with the roots of several tree species, being Quercus ilex the main host species used for producing mycorrhized seedlings under controlled nursery conditions. The quality of these seedlings must be ensured to achieve reliable yields in truffle orchards. Among the methods being implemented to ensure this quality is the use of plant growth-promoting bacteria, known as PGPR. The aim of this research was to isolate and study the PGPR potential of the bacteria present in the soils of high production black truffle plantations within their natural distribution area in order to evaluate their use to improve the production and quality of mycorrhized seedlings. Isolated bacterial strains were evaluated using four PGPR tests, including Indole-3-acetic acid (IAA) production, 1-amino-cyclopropane1-carboxylate deaminase (ACCD) activity, siderophore synthesis and phosphate solubilization. Once characterized, the bacterial strains showing the best performance in each assay were selected for controlled nursery trials with Quercus ilex seedlings mycorrhized with black truffle, resulting in four selected bacterial strains. Seedlings received inoculations of individual bacterial strains as well as a combined treatment of all four strains. After several months to allow the symbiotic association to develop, seedlings will be assessed in terms of growth and mycorrhization percentage to evaluate the influence of each bacterial treatment. This approach promotes the application of native soil bacteria, helping to fill knowledge gaps in truffle cultivation and support the successful development of mycorrhized seedlings in nurseries.

CARBON BALANCE IN A DEHESA SYSTEM IN THE WESTERN IBERIAN PENINSULA

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Keywords: Dehesa, dendrochronology, carbon balance, agroforestry systems, climate change mitigation

Mediterranean dehesas are agroforestry systems with a high potential as carbon sinks; however, their actual capacity to offset emissions strongly depends on forest structure and livestock management. In this study, the carbon balance of a dehesa in the western Iberian Peninsula is quantified using a direct dendrochronology-based approach, integrating the results of a Bachelor's Thesis within the framework of a broader project assessing carbon fluxes in managed dehesa systems. The study was conducted at the El Sestil study site (Salamanca, Spain), a mixed dehesa dominated by Quercus ilex and Quercus pyrenaica under extensive livestock management (0.28 LSU·ha⁻¹), and compared with the Campanarios de Azaba Biological Reserve, where livestock pressure is currently residual. Circular plots were sampled to characterize forest structure, and dendrochronological cores were extracted from Quercus ilex, Quercus pyrenaica, Quercus faginea and Fraxinus angusifolia. Annual radial growth was used to reconstruct biomass increment through species-specific allometric equations, allowing estimation of annual carbon sequestration in tree biomass and its conversion to CO_2 equivalents. Livestock-related emissions were calculated using published emission factors, while soil carbon inputs were incorporated using reference values from comparable dehesa systems. Mean carbon sequestration by forest biomass in El Sestil was 1.71 ± 0.28 t CO_2-eq·ha⁻¹·yr⁻¹, similar to Campanarios (1.79 ± 0.37 t CO_2-eq·ha⁻¹·yr⁻¹). When soil carbon sequestration was included, total ecosystem uptake reached 5.05 t CO_2-eq·ha⁻¹·yr⁻¹. At the farm scale, this offsets 283% of annual livestock emissions, confirming the system as a net carbon sink. Interannual variability was closely linked to precipitation, and tree basal area emerged as the main predictor of carbon sequestration.

HOW COMPETITION STRUCTURE DRIVES DROUGHT RESILIENCE IN SUPRAMEDITERRANEAN PINE FOREST: A CASE STUDY

Maestre-Villanueva, Jorge.[1*], Acuña-Míguez, Belén. [2], Ordóñez, Cristóbal. [3], Colorado, Irene. [4], Cruz, Marcelo. [5], Bravo-Oviedo, Andrés. [1]

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Keywords: Dendrochronology, Diversity, Tree Growth, Neighborhood, Resistance. The increase in the frequency and severity of droughts in Mediterranean regions is compromising the stability and performance of forest ecosystems. Analyzing tree responses to these episodes is essential to guide adaptive forest management strategies. In this study, growth resilience to drought is assessed in a mixed Mediterranean pine forest, analyzing the role of intra- and interspecific competition using the classical indices proposed by Lloret et al. (2011) and more recent metrics such as GYL (Growth Years Lost) and Grs (Ovenden et al., 2021). These indicators incorporate the magnitude and persistence of drought impacts, allowing estimation of years of growth lost and recovery capacity. Mixed models were applied, including hierarchical effects and Ornstein–Uhlenbeck-type temporal correlation structures to capture dependence among drought events. Resistance to water stress (Rt) showed a clear dependence on species identity and neighborhood composition, with interactions conditioning growth reduction during the event. The GYL index showed that the duration of growth loss is modulated by competition in different ways between species. Grs and the recovery index (Rc) indicated that post-drought recovery is determined by species identity, competitive intensity, and neighborhood composition, highlighting the modulatory role of heterospecific neighbors relative to competition. The classical resilience (Rs) and relative resilience (RR) indices showed divergent responses. While Rs did not present clear associations with neighborhood structure, RR reflected consistent relationships with the density and composition of the immediate surroundings. In particular, relative resilience increased under high competition when it was predominantly interspecific, pointing to a buffering effect associated with functional diversity. Likewise, situations of extremely high density may, in some cases, favor resilience. Discrepancies between classical and modern metrics when comparing species underscore the complex and multidimensional nature of the resilience process. Overall, the results show that forest growth resilience depends on species identity and community structure, emphasizing the importance of competition dynamics in forest management under climate extremes.

INTEGRATING AIRBONE LASER SCANNING DATA, TOPOGRAPHY, AND CLIMATE METRICS FOR FOREST FUEL MAPPING IN THE WESTERN U.S.

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Keywords: Airbone Laser Scanning, Aboveground Biomass, Canopy bulk density, Canopy base height, Canopy fuel load, Dominant height, Random Forest.

Airborne laser scanning (ALS) data acquisitions are increasingly valuable for mapping forest structural attributes and supporting wildfire management strategies, particularly in fire-prone ecosystems. This study focused on developing Random Forest models to predict 10 forest attributes in three groups (i.e., canopy fuels, biomass fractions and other attributes). The models use predictors from ALS data, topographic and climatic metrics in 11 states of the western United States. To ensure robust and generalizable predictions we used systematically obtained ground observations from the Forest Inventory and Analysis program to train predictive models. We applied the VSURF (Variable Selection Using Random Forests) algorithm to identify the most informative predictors from the pool of ALS-derived metrics, climate and topographic variables. VSURF allowed us to reduce multicollinearity, which enhanced model interpretability, and ensured that only variables contributing meaningfully to predictive performance were retained in the final Random Forest models. The performance of the models varied across groups of predicted forest attributes. For biomass-related variables, including above ground biomass, below ground biomass and foliage biomass, the Random Forest models showed strong predictive performance, with R^2 values ranging from 0.65 to 0.84. Models developed for canopy fuel attributes, such as canopy bulk density, canopy fuel load, canopy base height, and canopy height, showed R^2 values between 0.48 and 0.83. Finally, for other structural attributes, including total volume, quadratic mean diameter, and dominant height, model performance was more variable, with R^2 values ranging from 0.35 to 0.86 with the highest R2 being the one obtained for dominant height.

HEIGHT-DIAMETER EQUATIONS FOR MERCHANDABLE VOLUME ESTIMATION: A CASE STUDY FOR OAK AND PINE SPECIES IN NORTHER SPAIN

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Keywords: Modelling, Forest management, Tree allometry, Mediterranean forests, Spain

Changes in historical forest management practices in Spain, together with the ongoing climate change, are two major factors that have altered growth patterns in many Iberian forest stands. The regional forest service within the territorial administration (Junta de Castilla y León, JCyL) has identified that the height–diameter model currently used in forest management no longer accurately represents local allometries. To address this issue, the JCyL requested the development of an updated model for a specific forest located on the northern plateau, in the province of Palencia. We created a complete dataset combining forest management plots and tree selection plots provided by the regional administration. To increase sample size and enhance model performance, nearby National Forest Inventory (NFI) plots were also incorporated. Using these data, we verified whether the current model produces inaccuracies and then proceeded to fit 95 candidate height–diameter models. We selected the best-performing one for each target species (Pinus pinaster, Pinus nigra, Pinus sylvestris and Quercus pyrenaica) and then conducted an evaluation to compare the new models with the one currently in use. This allowed quantifying potential over- or underestimation of tree height and, consequently, timber volume, biomass and carbon sequestration. Our results support growth modelling by providing reliable height estimations and contribute to forest planning under changing environmental conditions.the possibility of using them for different purposes in a time and cost-effective way.

DIFFERENT PHENOTYPIC PLASTICITY FOR MALE AND FEMALE REPRODUCTIVE ALLOMETRY AMONG PINUS PINASTER PROVENANCES

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Keywords: reproductive allocation, phenotypic plasticity, genotype-by-environment interaction, Pinus pinaster, adaptation

Reproductive allometry describes how reproductive investment scales with vegetative size and provides insight into growth-reproduction trade-offs in long-lived trees. In Pinus pinaster Ait., a species distributed across strong environmental gradients, these relationships may vary due to both phenotypic plasticity and population differentiation. We analysed size-dependent male and female reproductive expression in 25 provenances grown in two contrasting common gardens in northwestern Spain: a high-productivity Atlantic site (MER) and a low-productivity mountainous site (IBI). Tree height and basal diameter were used as proxies of size, together with records of female cone production over multiple years and male strobili presence. Growth and reproductive activity were strongly reduced at the low-productivity site. After accounting for size, female reproduction appeared more constrained by environmental conditions and showing a marked provenance x site interaction, whereas male reproduction showed a sharper site contrast and limited provenance-specific responses. Overall, results indicate marked phenotypic plasticity in reproductive allometry, with sex-specific and provenance-specific responses to site productivity.

OPTICAL AND RADAR SATELLITE VARIABLES AS PROXIES FOR TUBER MELANOSPORUM MYCELIUM DYNAMICS

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Keywords: ectomycorrhizal mycelium, PlanetScope, Sentinel-2, Sentinel-1, Tuber melanosporum

Remote sensing provides valuable information on vegetation status. Optical remote sensing data primarily capture canopy and soil surface properties, and their relationship with mycelium biomass is therefore indirect, reflecting above-ground conditions that may be linked to subsurface fungal dynamics. This study explores the relationship between satellite-derived optical and radar variables and the development of Tuber melanosporum mycelium in truffle plantations and, also, in natural oak-forests across northeastern Spain. We used optical data from high-resolution PlanetScope to derive NDVI and from Sentinel-2 to calculate several vegetation indices (NDVI, NDMI, NDWI and EVI), as well as Sentinel-1 SAR data to obtain backscatter coefficients (VV and VH). Analyses were conducted for four seasonal periods—autumn 2019, autumn 2020, spring 2020 and spring 2021—using satellite acquisitions temporally coincident with field measurements of mycelium biomass (N = 492). Results derived from Planet NDVI reveal a marked seasonal dependence in the NDVI–mycelium relationship, with a significant negative association observed in spring 2020, while autumn periods showed weak or non-significant correlations; spring 2021 exhibited a negative tendency, although not statistically significant. Analyses based on optical indices from Sentinel-2 showed generally limited explanatory power despite the evaluation of multiple indices, although NDMI displayed a negative tendency under wetter conditions. In contrast, Sentinel-1 VV and VH backscatter exhibited moderate negative correlations with mycelium during spring campaigns, indicating a higher sensitivity of radar metrics to structural or moisture-related factors linked to fungal development. These findings suggest that both optical and radar data can contribute to improving predictions of mycelium production or provide complementary information on its spatial and temporal behaviour in truffle ecosystems.

SESSION III

EFFECT OF THINNING ON GROWTH RESPONSE TO DROUGHT OF PINUS PINASTER IN MIXED QUERCUS PYRENAICA STANDS

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Keywords: climate change, disturbance, dendrochronology, traits, dynamics.

Understanding how forest management modulates tree responses to increasing drought stress is crucial under current climate change scenarios. This study assessed the effects of thinning intensity on the drought resistance, resilience, and recovery time of maritime pine (Pinus pinaster Ait.). Thinning—applied only to maritime pine—included three treatments: control, moderate, and heavy thinning, each replicated three times within mixed stands of maritime pine and Quercus pyrenaica Willd. in Lubia, Soria. Tree responses to drought of varying severity were quantified using tree-ring series, applying standardized resilience indices. Generalized mixed models revealed that thinning significantly modifies tree growth response to drought, but its effects depend on drought severity and the temporal context of stress. Thinning enhanced short-term post-drought performance, particularly improving resilience and recovery after single drought events. However, under successive or more intense droughts, heavy thinning did not consistently improve performance and, in some cases, was associated with reduced resilience and slower recovery, indicating a trade-off between short-term benefits and long-term stability. These results highlight that thinning alters not only the magnitude but also the structure of drought responses, and that management strategies should consider both drought severity and recurrence to optimize forest stability under future climatic conditions.

IMPACT OF CLIMATE CHANGE ON THE DISTRIBUTION OF EUROPEAN BEECH AND ITS CONVERGENCE WITH THE NATURA 2000 NETWORK

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Keywords: Fagus sylvatica distribution, Global change, Europe, Natura 2000 Network, Systematic review

Climate change is profoundly altering the distribution and ecological functioning of Fagus sylvatica across Europe, a species strongly dependent on the balance between temperature and water availability. This review synthesizes recent evidence to assess how climate change is affecting the distribution of this species and how its future suitability aligns with the Natura 2000 Network, the main system of protected areas in the European Union. Based on a systematic search of major scientific databases, we integrate ecophysiological studies, field observations, and species distribution models, all of which consistently identify high summer temperatures and water deficits as the most limiting factors for the growth, regeneration, and long-term persistence of European beech. Future scenarios project increased fragmentation in vulnerable regions and a concentration of suitable habitat in climatic refugia associated with altitudinal gradients and soils with great water-holding capacity. The alignment between these trends and the Natura 2000 Network is uneven: montane protected areas retain high suitability, whereas low-elevation sites face an elevated risk of mismatch. Overall, the results underscore the need for adaptive conservation strategies that prioritize climatic refugia, strengthen landscape connectivity, and anticipate projected changes, with the aim of ensuring the representativeness of beech and the ecological functionality of its forests under progressive climate change.

MANGROVES OF SOUTH AMERICA AND THEIR EFFECTS DUE TO CLIMATE CHANGE

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Keywords: blue carbon, global change, conservation, Pacific, carbon storage

Mangroves are highly productive coastal ecosystems that provide important ecological, social, and economic services, including coastal protection, maintenance of biogeochemical cycles, and a high carbon storage capacity. However, these ecosystems are highly vulnerable to global change and anthropogenic activities, especially in tropical and subtropical regions such as South America. The objective of this literature review was to analyze the effects of global warming and human activities on mangroves in South America, assess changes in their extent over time, and review the main mitigation and conservation strategies documented in recent scientific literature. A systematic review was conducted following the PRISMA guidelines. The PubMed, Scopus, and Web of Science databases were searched, considering publications between 2020 and 2025 in English and Spanish. After the selection process, 33 studies were included, organized into the following categories: mangroves and global change, mangrove extent, anthropogenic impact, and mitigation and conservation strategies. The results show that the structure, composition, and function of mangroves are strongly influenced by climatic factors, such as sea-level rise and the intensification of extreme events, as well as by anthropogenic pressures associated with land-use change, deforestation, and pollution. Furthermore, a heterogeneous spatial dynamic is evident in the extent of mangroves in South America, with simultaneous processes of expansion and loss. Finally, the literature highlights that restoration based on natural processes, blue carbon conservation, and community participation are key strategies for mitigating the impacts and conserving these ecosystems in the face of global change.

ADAPTIVE MANAGEMENT FRAMEWORK FOR IMPROVING FISHWAY PERFORMANCE

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Keywords: Adaptive Management, Fish Passage, Longitudinal Connectivity, Real-time Monitoring, Predictive Modelling

The fragmentation of river ecosystems by hydropower infrastructure poses significant threats to aquatic biodiversity, creating an urgent need for effective fish passage solutions able to cope with environmental variability. Adaptive management of fishways offers strong potential to enhance longitudinal connectivity and ecological resilience, yet its practical application remains limited. This study presents an adaptive management framework to optimize fish passage by integrating affordable hydraulic and environmental monitoring, automated data processing and predictive modelling. The framework combines a sensor network measuring water levels along the fishway and key environmental drivers with biological performance metrics derived from Passive Integrated Transponder detections, processed locally using edge computing. Using two years of weekly aggregated data, Random Forest models were developed to explain and predict fish passage. The final model relied on five key drivers, including luminosity, water temperature and three nested hydraulic parameters at the upstream section of the fishway. A field application at a vertical slot fishway in Vadocondes on the Duero River in Spain demonstrated the effectiveness of the framework. Retrospective optimization showed that sluice gate regulation, which increases downstream water level and reduces the drop at the first cross wall, can substantially enhance predicted fish passage without modifying hydropower plant operation. The proposed framework is flexible, scalable and transferable to other regulated rivers, although successful implementation depends on clearly defined ecological objectives and integration with infrastructure operation. scopariusnurse shrubs have a key role in the biodiversity conservation of grasslands in mining areas of northern Spainby promoting ß-diversity under its canopy.

LAND USE LAND COVER CHANGE DETECTION IN GROMBALIA REGION (TUNISIA), USING MACHINE/DEEP LEARNING AND SENTINEL-2 IMAGERY

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Key words: Random Forest, Support Vector Machine, Convolutional Neural Network, Classification, Kappa index

Since the launch of the Sentinel satellite missions, their imagery has been widely used for natural resources monitoring and management. This study aims to detect changes in land use land cover (LULC) between the 2016/2017 and 2020/2021 agricultural years using multi-temporal Sentinel-2 imagery in the Grombalia region, Tunisia. To achieve this, images from November 2016, January 2017, March 2017 and May 2017 and November 2020, January 2021, March 2021 and May 2021 were downloaded and preprocessed. Field surveys were conducted during 2017 and 2020 to collect reference data, and training and testing areas were delineated, covering more than 5% of the total study area, from which a shapefile was generated. Three supervised multi-temporal classification algorithms were applied: two from the machine learning domain: Random Forest (RF) and Support Vector Machine (SVM) and one from deep learning, namely a Convolutional Neural Network (CNN). The classification results were assessed using Kappa accuracy metric. The classifier yielding the highest accuracy metrics was considered the most effective. LULC changes between the two agricultural years were then identified in terms of spatial distribution and area extent. All three methods accurately classify the LULC of the Grombalia region. However, RF outperforms SVM and CNN. A total of eleven land cover classes are mapped. Citrus orchards occupy the largest area, followed by olive groves and vegetable crops.

MOLECULAR RESPONSES TO GRAFTING IN MARITIME PINE: ANALYSIS OF GENOTYPES WITH CONTRASTING DROUGHT RESPONSES AND FUNCTIONAL CHARACTERIZATION OF CANDIDATE GENES INVOLVED IN GRAFTING AND DROUGHT RESPONSE

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Keywords: tolerance, stress, DEG, transcriptomics, communication

Maritime pine (Pinus pinaster Ait.) is an autochthonous tree species of western Mediterranean forests that inhabits a wide range of different ecosystems. It exhibits high genetic plasticity and adaptive variability, making it an excellent model for studying adaptive traits such as wound stress and drought tolerance. In this context, this study aims to further explore the molecular basis of drought tolerance in conifers through three complementary approaches. First, gene annotation was performed through a de novo transcriptomic assembly to enhance the characterization of gene structure and expression, particularly under water stress conditions. Previous analysis on drought tolerance in P. pinaster have identified several candidate genes showing high sequence similarity to genes from other conifer species. However, many of these genes could not be annotated using major angiosperm databases due to limited or absent sequence homology. Second, long-distance signaling and communication under water stress was investigated using grafted pines. This experimental system enabled the analysis of gene expression associated with scion-rootstock interactions by comparing transcriptional profiles of heterografted, autografted and ungrafted pines, using both drought-sensitive and drought-tolerant genotypes. Third, organ-specific transcriptomic responses were analyzed. Through RNAseq analysis, gene expression in needles, scion and rootstock stems, and roots was assessed to identify differentially expressed genes (DEGs) related to water stress and grafting effect.

THE OTHER FACE OF RECOVERY: A REVIEW OF THE HUMAN DIMENSION OF EUROPE'S RETURNING LARGE CARNIVORES

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Keywords: human-wildlife coexistence, ecological restoration, systematic review, top predator, recolonization

The return of Europe's large carnivores offers an unprecedented opportunity for trophic restoration, yet its success depends not only on ecological conditions but also on human acceptance. Understanding how social aspects are addressed across Europe is essential to anticipate challenges and guide restoration strategies. Using peer-reviewed databases (WOS, Scopus, PubMed), we systematically collected empirical studies addressing the human dimension of large carnivores in a restoration context (1999-2023). From 107 articles, we extracted information on spatio-temporal patterns, ecological and human dimension aspects, resulting in 260 case studies. Our analysis shows that research on the human dimensions of carnivore recovery has increased over time; however, few studies adopt longitudinal or cross-border approaches, despite many populations spanning multiple countries. Wolves are the most studied species, followed by brown bears, with studies concentrated in Northern and Central Europe and largely focused on established populations. Emerging populations remain underrepresented, limiting the ability to anticipate conflicts during range expansion. Among the case studies addressing the human dimension, passive restoration interventions predominate, whereas active interventions are reported only for brown bears and both lynx species. While nature's contributions to people (NCPs) from carnivores are generally acknowledged, studies more often emphasize detrimental rather than beneficial NCPs. By revealing how and where human dimension have been studied, our review highlights critical gaps for supporting trophic restoration through carnivore recovery. Integrating human dimensions requires assessing social acceptance in emerging populations, standardizing longitudinal monitoring and social indicators, and promoting cross-border collaboration to facilitate long-term coexistence across Europe.

INFLUENCE OF DIFFERENT COMBINATIONS OF GIBBERELLIC ACID AND SILICON ON SUMMER TOMATO IN ROOFTOP GARDEN

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Keywords: Urban agriculture; Sustainable crop production; Hybrid summer tomato; Plant growth regulators; Heat injury

The global population expansion increases the resource consumption, ultimately threatens the ecosystem, changes the environment, and strains humanity's ability to feed itself. It is well known that the following reasons are involved in changing the environment, viz., over population, rising temperature, excess CO2, CH4, N2O emission, etc. The augmentation of urban vegetation is an outstanding mitigation strategy to keep the sound environment in the city. An experiment was conducted in the rooftop garden of the Agricultural Botany Department, Sher-e-Bangla Agricultural University, Dhaka from June to October 2016 to assess the influence of different combinations of gibberellic acid (GA) and silicon (Si) on summer tomato cultivation for spreading sustainable urban agriculture in the Dhaka city. This research was conducted to identify the effects of gibberellins and silicon application on summer tomato with their best possible interaction. GA3 and Silicic acid (SA) were used as source of GA and Si, respectively. Four different combinations of GA and Si were H0= 0 ppm GA3 and 0 mM Si, G=20 ppm GA3 and 0 mM Si, Si=0 ppm GA3 and 0.4 mM Si, GSi= 20 ppm GA3 and 0.4 mM Si. The experimental results showed that different combinations of GA and Si significantly influenced to change morpho-physiology, yield contributing characters and fruit yield of summer tomato. Exogenous application of 20 ppm GA and 0.4 mM Si significantly increased plant height (119.1 cm), leaf number plant-1 (85.58), number of branches plant-1 (15.75), SPAD value (55.66) and yield contributing characters like number of flower clusters plant-1 (12.83), number of flowers plant-1 (40.42), number of fruits plant-1(9) and individual fruit weight (17.43). In contrast, leaf water loss as measured in percent of fresh weight was minimum (8.32) with application of Si. The sole or combined application of GA and Si influenced the yield of tomato. The lowest yield plant-1 (84.93) was observed in controlled condition, whereas the highest yield plant-1(159.0) was observed in combined application of GA and Si. Therefore, it may be suggested that combined application of 20 ppm GA and 0.4 mM Si increased the yield of summer tomato by improving morpho-physiological and yield contributing characters.

SESSION IV

TEMPORAL DYNAMICS OF TREE SPECIES COMPOSITION IN THE SPANISH IBERIAN RANGE: INSIGHTS FROM NATIONAL FOREST INVENTORY AND SATELLITE DATA

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Keywords: mixed forests; basal area dominance; Spanish National Forest Inventory (SNFI); Enhanced Vegetation Index (EVI); Northern Iberian Range

Forests in the Northern Iberian Range have undergone substantial compositional shifts, driven by extreme climatic events, human intervention, and evolving forest management objectives. However, these transformations remain underexplored. In this context, this study aims to detect changes in species composition, measured through shifts in tree species basal area dominance, using field data from three cycles of the Spanish National Forest Inventory (SNFI) spanning 1986 to 2018. In parallel, the spectral separability of forest types defined by the SNFI was assessed using long-term seasonal mean Enhanced Vegetation Index (EVI) values derived from Landsat imagery, aligned with the SNFI timeframe and processed through the Google Earth Engine (GEE) platform. Standard one-way ANOVA followed by Tukey HSD post hoc pairwise comparison was applied for winter, while Welch's ANOVA followed by Games-Howell post hoc pairwise comparisons was used for spring, summer, and autumn, after testing the residuals for normality and homogeneity of variance. The results reveal a consistent increase in mixed forests, primarily through the replacement of conifers by broadleaved species, particularly evergreen and marcescent types, and a notable expansion of mixed conifer stands. ANOVA results indicated significant seasonal differences among forest types, with summer showing the greatest spectral differentiation ($F = 690.3$; mean sum of squares = 4.735). Pairwise comparisons revealed that pure broadleaved deciduous and mixed conifer–broadleaved deciduous stands differ significantly from pure conifer and pure broadleaved evergreen stands across all seasons. In contrast, pairs such as pure conifer vs. pure broadleaved evergreen, and mixed conifer– broadleaved deciduous vs. mixed broadleaved deciduous evergreen, did not show significant differences in every season. These findings highlight the value of integrating field-based forest inventory data with seasonal spectral indices to monitor compositional shifts in forests. This integrated approach provides valuable insights for guiding climate-resilient forest management and biodiversity conservation strategies in the Northern Iberian Range.

IDENTIFYING THE SUITABILITY OF FOREST SPECIES UNDER CURRENT AND FUTURE CONDITIONS IN THE IBERIAN PENINSULA

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Keywords: species distribution models, climate change scenarios, forest carbon sinks

Forest species are likely to shift their spatial distribution due to climate change. Forecasting future distribution patterns is paramount for guiding sustainable management of forest ecosystems. We aim to model future species suitability for main forested species in the Iberian Peninsula under three climatic scenarios (SSP1-2.6, SSP3-7.0, and SSP5-8.5) up to 2100. This study falls within project ECO2FOR that aims to contribute to the fight against climate change by enhancing forest carbon sinks. We used Maximum Entropy (MAXENT) species distribution model to establish a relationship between known occurrences of species from Spanish national forest inventory and a set of environmental variables (climatic, topographic, solar radiation, and soil pH) that characterize the conditions of a specific area and simulate future trends based on climatic scenarios. Results include potential species suitability and change maps for both present and future scenarios for species, enabling the assessment of changes in the territory and species suitability. Mediterranean and thermophilous species are resilient, even extending their potential range. Submediterranean species show an intermediate response, with initial stability followed by significant long-term losses. Eurosiberian species are the most vulnerable, with major range contractions over time and under warmers scenarios. The general spatial pattern reveals both altitudinal and latitudinal shifts in suitable areas, characterized by a progressive loss of low-elevation habitats and an increasing concentration in mountainous and northern regions. This work represents an important contribution to enhancing forest management and provides insights to determine the most suitable tree species planting under climate change context.

ASSEMBLY OF XYLEM-INHABITING BACTERIAL COMMUNITIES FOR SUSTAINABLE MANAGEMENT OF OLIVE VASCULAR DISEASES

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Keywords: microbiome, Xylella fastidiosa, Verticillium dahliae, biological control, bacterial communities.

Infections caused by the fungus Verticillium dahliae (Vd) and the bacterium Xylella fastidiosa (Xf) represent major threats to woody plant species of high ecological and economic value, including olive (Olea europaea L.), a key component of Mediterranean agroecosystems. In line with strategies promoting sustainable plant protection, endophytes are emerging as promising biological tools for disease control. In this context, the functional assembly of synthetic microbial communities (SynComs) composed of naturally xylem-inhabiting bacteria offer a novel approach for the control of vascular plant pathogens.
In this work, over 100 bacterial strains isolated from olive xylem were characterized for phenotypic traits related to biocontrol potential and plant growth promotion. The assessed traits included: (i) carbon source assimilation and tolerance to abiotic stresses (antibiotics, low pH, salinity); (ii) 5 plant growth-promoting features; (iii) production of 13 antimicrobial enzymes; and (iv) in vitro inhibition of Vd and Xf. Compatibility assays among selected promising strains enabled the design of two SynComs, each consisting of three strains. Additionally, their compatibility was further validated in microfluidic chambers simulating xylem vessels.
SynCom biocontrol activity was evaluated in vitro against Vd and Xf using dual culture plates. Their in planta efficacy is being assessed in various pathosystems: including Xf and Vd in both Nicotiana benthamiana (model plant) and olive. Additionally, systemic xylem colonization by SynCom members and pathogens following endotherapy is being assessed by strain-specific qPCR.
This research was financially supported by projects MCIN/AEI/10.13039/501100011033 (PID2020-114917RB-100), MICIU/AEI/10.13039/501100011033 “European Union Next Generation EU/PRTR” (TED2021-130110BC41); project BeXyl (Grant ID 101060593, EU-Horizon Europe); Qualifica Project QUAL21_023 IAS and Grants MCIU/AEI JDC2024-053655-I and DIN2024-014162-2.

OPTIMISING URBAN TREE SELECTION IN ROTTERDAM

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1Bachelor's thesis from Erasmus University College, Rotterdam. Netherlands.

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Keywords:

This research investigates tree selection as a means to optimise the removal of air pollutants in urban environments, and considers the effects of tree-to-tree interactions on the drought resilience of these species. The research takes on a case study approach using the city of Rotterdam, identifying particulate matter (PM), nitrogen oxides (NOx), and ground-level ozone (O3) to be the major pollutants that pose serious health risks to city dwellers. The importance of increasing the drought resilience of urban trees is also highlighted in this study, due to the anticipated recurrence of reduced rainfall in the Netherlands. Water deficit poses a risk to urban trees that must be mitigated to promote and sustain healthy cities in the face of climate change. When assessing the role of tree interactions on their drought resilience, positive and negative species interactions are identified. With this, it was found that increasing biodiversity, more specifically functional trait diversity, is an effective way to facilitate positive species interactions and promote drought resilience in trees. After identifying a range of effective phytoremediating tree species for the stated air pollutants, their drought tolerance was assessed. This revealed that many of the trees capable of superior air pollutant phytoremediation in Rotterdam are somewhat drought tolerant, the planting pattern observed in the city poses a risk to the survival of urban tree communities. The implementation of linear forests is then proposed as an alternative way to plant trees in Rotterdam, which the findings of this study indicate could increase the capture of air pollutants and the drought resilience of urban trees, namely through selection effects. To realise this potential in urban environments, close attention must be paid to select trees with dissimilar functional traits for mixed-species planting configurations.

WHY EARLY COMPETITION MATTERS FOR BUILDING CLIMATE-RESILIENT MIXED FORESTS

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Keywords: Early stand development, Tree competition, Mixed-species forests, Biomass allocation, Tree allometry

Mixed-species forests are increasingly promoted as a strategy to enhance ecosystem resilience under climate change. Yet, the long-term success of these forests is strongly influenced by processes occurring at very early stages of stand development, when young trees compete intensely for light and other resources. This critical phase remains poorly understood, particularly in Mediterranean forest systems. We investigated how early competition shapes tree growth strategies in young mixed stands of Scots pine (Pinus sylvestris L.) and Pyrenean oak (Quercus pyrenaica). Using destructive sampling of 90 trees (15–18 years old), we examined how competition influences tree architecture (height and crown structure) and how biomass is allocated among stems, branches, and foliage. Our results indicate that competition already has a significant impact at this early stage. Increased competition altered tree allometry, weakening the relationship between stem diameter and height and modifying crown structure. Importantly, the two species employed contrasting strategies in response to competition. Scots pine invested relatively more biomass in branches and foliage, reflecting a strategy aimed at rapid light capture, whereas Pyrenean oak allocated more biomass to the stem, suggesting a more conservative, structurally oriented strategy linked to drought tolerance. We also found that competition affects biomass allocation mainly indirectly, by promoting height growth, which in turn increases stem and branch biomass while leaving foliage biomass largely unchanged. This highlights tree height as a key mediator between competition and biomass distribution. These findings demonstrate that early competition can set forests on distinct developmental trajectories long before canopy stratification develops. From a management perspective, this emphasizes the importance of early, low-cost interventions such as light pre-commercial thinning to maintain species coexistence and guide young mixed forest stoward greater structural stability and climate resilience.

OPTIMIZING FIRE SEVERITY MAPPING IN MEDITERRANEAN ECOSYSTEMS: A COMPARATIVE ANALYSIS OF HYPERSPECTRAL AND MULTISPECTRAL VEGETATION INDICES

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Keywords: Fire severity, PRISMA, Sentinel 2, hyperspectral indices, CBI.

Forest fires are the primary disturbance in Mediterranean ecosystems, making accurate severity assessment essential for quantifying ecological impacts and guiding effective restoration. This research estimates fire severity in the Sierra de La Culebra wildfire (Spain) by generating a set of vegetation indices (VIs) from PRISMA hyperspectral and Sentinel-2 multispectral satellite. These VIs were correlated with the Composite Burn Index (CBI) levels (vegetation, soil, and site), analyzed across vegetation formations (coniferous, broadleaf, and shrubland). The VIs computed included conventional multispectral, adapted broadband, and specific narrowband hyperspectral indices. Fire severity was then extrapolated and mapped across the study area for visualization. Hyperspectral data provided a superior and more continuous spectral characterization of fire severity than multispectral imagery, resulting in stronger correlations with CBI values. The CBI at the vegetation level consistently demonstrated higher correlations with VIs than soil-related CBI, reflecting the spectral indices' sensitivity to canopy damage. Among the best-performing indices, those incorporating red-edge, NIR, and SWIR bands showed the highest explanatory power. For hyperspectral data, the Red Edge Difference Vegetation Index (DVIRED), Enhanced Vegetation Index (EVI), and Cellulose Absorption Index (CAI) were the most effective, with CAI achieving the strongest correlation (R^2 = 0.808). For multispectral imagery, the normalized difference red edge (NDRE), the red edge chlorophyll index (CIREDGE), the enhanced normalized difference vegetation index (ENDVI), and the green normalized difference vegetation index (GNDVI) performed best. These findings demonstrate the potential of hyperspectral remote sensing for detailed, scalable, and accurate post-fire assessment within heterogeneous Mediterranean ecosystems.

THE LANDSMART GRAZING PROGRAM: HOW RETURNING TO TRANSHUMANCE SYSTEMS CAN IMPROVE CALIFORNIA LANDSCAPES AND BUILD COMMUNITY

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The California North Bay Area Mediterranean climate ecosystems are a globally recognized biodiversity hotspot, characterized by rolling hills of oak woodlands and grasslands. Since the introduction of invasive species following colonization, grasslands in California have largely shifted to non native annual species, not well adapted to wildfire. Additionally, the reduction in transhumance systems, the tradition of moving livestock from one grazing ground to another on a seasonal cycle, and disruption of native ungulate migration patterns, has removed the grazing disturbances native grasslands are adapted for. Catastrophic wildfires have increased in frequency and intensity globally, and especially in the North Bay Area, with lives, property, and sensitive habitats lost or severely damaged annually. The LandSmart Grazing Program is a collaboration of California State Resource Conservation Districts (RCDs), University of California Cooperative Extension (UCCE), Wild Oat Hollow (private consultant) and local livestock graziers and ranchers to design, implement, and educate local municipalities, land managers, and private landowners about projects related to utilizing livestock grazing as a fire mitigation tool in North Bay ecosystems. This project prioritized properties previously burned to remove invasive species, reduce fuel loads, and create access for more intensive mechanical forestry operations. Public funding was utilized over the last 6 years to pay for contract grazing on thousands of acreages of private and public land, install permanent grazing infrastructure such as fencing and water systems, host community education workshops for both the general public and grazier community, outfit local graziers with new equipment to increase their capacity, as well as host the annual Transhumance Festival in Petaluma, California. Results from grazing projects varied based on the landowner's priorities. Fire risk was temporarily reduced by reduction of fuel loads and disruption of fuel continuity, increased forb diversity was observed, and in areas grazed for multiple years consecutively, native perennial bunch grasses appeared to increase as seed banks transitioned from grazing disturbances.

PLANIFICACIÓN DE LAS INFRAESTRUCTURAS VERDES URBANAS EN EL TÉRMINO MUNICIPAL DE VILLAMURIEL DE CERRATO (PALENCIA)

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The purpose of the study was to develop a strategic plan for the planning and improvement of green infrastructure in Villamuriel de Cerrato. The methodology was based on the definition of zoning adapted to the case study, based on technical references. Exhaustive fieldwork was carried out to identify and classify the different green spaces, 354 urban green infrastructure and 20 peri-urban green infrastructure (parks, gardens, roadside trees, etc.), complemented by meticulous desk research using the inventory compiled. The inventory revealed a green space per inhabitant far exceeding the minimum recommended values and a great diversity of tree species. Indicators were used to assess the state of conservation of each space, differentiating between those in good condition, those requiring minor/moderate intervention and those requiring urgent action due to problems of accessibility, safety, degradation or poor maintenance. The analysis identified specific needs: replacement of dead trees and shrubs, enlargement of tree pits, replanting of grass, phytosanitary treatments, repair of pavements, installation of street furniture and lighting, as well as cleaning and refurbishment of abandoned areas. Based on this diagnosis, proposals were formulated around four strategic areas. The first consisted of corrective actions to address deficiencies. The second proposal suggested using 'undeveloped municipal land' to create new green areas with plantings, paving and street furniture. The third proposed creating new ecological corridors to improve connectivity for biodiversity. Finally, the fourth proposal suggested new alignments of roadside trees to provide shade, improve environmental quality and promote landscape integration. Each proposal included species suitable for the climate and available space, planting distances, landscaping types and complementary interventions such as the installation of automatic irrigation or street furniture. A five-year implementation schedule has been set: in the first two years, priority was given to resolving urgent problems and implementing ecological corridors, leaving the creation of green areas on plots of land and the installation of new alignments for later phases. The estimated budget for developing all the proposals amounted to €1,717,164.14, with most of it allocated to the transformation of municipal plots, followed by roadside trees, corrective actions in existing areas and, lastly, ecological corridors, representing the lowest cost.

The conclusions have indicated that Villamuriel de Cerrato has a good provision and diversity of green spaces, although specific actions are required to improve the quality, accessibility, functionality and maintenance of its green infrastructure, as well as enhancing its ecological connectivity and making use of open areas. This would increase the environmental, social and aesthetic benefits offered to citizens. In short, this study is a strategic municipal tool for prioritising actions and possible funding and subsidies. In addition, the methodology developed is intended to serve as a replicable example for other municipalities seeking to enhance their green infrastructure, highlighting the importance of planned management to maximise the ecosystem and social benefits that these spaces offer citizens.

SESSION V

POINTNET++-BASED INDIVIDUAL TREE SPECIES CLASSIFICATION FROM HIGH-DENSITY MOBILE AND PUBLIC LIDAR DATA

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Keywords: LiDAR point clouds; Individual tree segmentation; Tree species classification; PointNet++; Deep learning; Mobile terrestrial LiDAR; Forest inventory

Tree species classification using LiDAR data is a key component of forest inventory and ecological monitoring, yet it remains challenging due to structural similarity between species and variability across acquisition platforms. In recent years, deep learning methods operating directly on three-dimensional point clouds have shown promising results, although their application to high-density terrestrial and mobile LiDAR data remains limited. This study considers the problem of automatically classifying Quercus pyrenaica and Pinus sylvestris and evaluates the performance of the Ensemble PointNet++ architecture for individual tree species classification using high-density mobile LiDAR point clouds. The proposed methodology integrates field-acquired mobile terrestrial LiDAR data collected with a CHCNAV RS10 slam system and publicly available LiDAR data from the FOR-SPECIES 20K dataset. A balanced dataset comprising 160 manually segmented trees was constructed, including 80 samples of Quercus pyrenaica and 80 samples of Pinus sylvestris. Each tree point cloud was randomly sampled to 200,000 points and augmented through rotational sampling before being used to train a Neural Network from Ensemble PointNet++. The dataset was divided into training and validation subsets following a 70/30 split. Model training was conducted for 10 epochs, and performance was evaluated using precision, recall, F1-score, and confusion matrix analysis. The proposed approach achieved a weighted mean F1-score of 0.94 on the validation dataset, demonstrating strong discriminative capability between the two species. Results indicate that PointNet++ effectively captures multi-scale geometric features from dense point clouds and generalizes across different tree sizes, which is very encouraging for forest inventories in mixed mediterranean forests dominated by Quercus pyrenaica and Pinus Sylvestris These preliminary findings highlight the potential of point-based deep learning models for tree species classification using mobile LiDAR data, and provide a foundation for future research on scalable and transferable deep learning approaches in forest environments.

KNOWLEDGE OF WILD EDIBLE PLANTS ACROSS SOCIAL GROUPS IN NORTHERN ETHIOPIA

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Keywords: Dryland, food security, knowledge distribution, plant diversity, semi-arid ecosystem

Alder decline caused by Phytophthora species represents a major threat to riparian Wild edible plants (WEPs) are crucial for food security and cultural resilience in dryland communities like Abergele District, Northern Ethiopia. This study documented 40 WEP species across 22 families, predominantly trees and shrubs, and analyzed knowledge variation among 387 informants. Significant differences in WEP knowledge were found across social groups. Key informants knew nearly twice as many species as general informants, men identified more than women, and knowledge increased strongly with age. Statistical analysis (PERMANOVA, NMDS) confirmed informant type as the strongest predictor of knowledge composition. Most WEPs are consumed as fresh fruits, with availability peaking from June to October the annual food-scarcity season highlighting their dietary role. The findings emphasize WEPs as indispensable to local food strategies while revealing urgent knowledge disparities. We recommend documenting ethnobotanical knowledge, integrating WEPs into food-security planning, and pursuing research on nutrition, domestication potential, and ecology of high-value species to strengthen sustainable livelihoods in drylands.

TIMBER HARVESTING AND SUSTAINABLE FOREST OPERATIONS

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Keywords: Timber harvesting , sustainable forest operations, forest ecosystem, environmental impacts, forest regeneration

Forests play a significant role to support ecological balance, shielding biodiversity, protect from global warming and providing needful vital resources for human organizations and forests also help to reduce air pollution. One major reason timber harvesting is necessary is to maintain healthy forest ecosystems. Forests are dynamic environments where trees naturally grow, age, and die. If forests are left completely unmanaged, overcrowding can occur, leading to competition for sunlight, water, and nutrients. This competition can weaken trees and make forests more vulnerable to pests, diseases, and wildfires. Selective timber harvesting removes older, damaged, or overcrowded trees, allowing younger and healthier trees to grow and improving overall forest health. So through the forest-related exercises, timber harvesting defines essential component of the forest-wood supply chain. However, it is usually misread and wrongly considered deforestation. Timber harvesting, when decently organized and well managed. it is a specialized and regulated procedure that involves tree felling, cleaning forests, extraction and transportation, while ensuring regeneration and permanent sustainability. So this abstract explores the theory of timber harvesting within the infrastructure of Sustainable Forest Operation (SFO). It emphasizes the differentiate between timber harvesting and deforestation and pointing out that sustainable timber harvesting does not necessarily lead to forest degradation. Modern forest operations integrate technical feasibility, environmental protection, economic viability, and institutional regulations. Factors such as terrain conditions, harvesting technologies, infrastructure, and worker safety play a decisive role in determining appropriate harvesting systems. Moreover, the study discusses the environmental effects of timber harvesting especially on soil, water, vegetation, and wildlife. but on the other hand operations are poorly planned impact very negative effects such as soil compaction, erosion, and habitat disturbance may occur. Conversely, the application of advanced forest technology, ergonomic tools, and proper training can significantly reduce these impacts while improving efficiency and worker's safety. In the atmosphere of climate change and increasing demand for bio-based products, sustainable timber harvesting has accumulated renovated importance. it contributes to circular economy principles by providing renewable raw materials for construction, energy, and industry. Therefore,

COMMUNITY ASSEMBLY IN SHRUBLAND ECOSYSTEMS: THE ROLE OF ABIOTIC AND BIOTIC FILTERS ALONG SECONDARY SUCCESSION

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Keywords: Community assembly, environmental filtering, secondary succession, Mediterranean shrublands

Reliable estimates about the state of the forest are needed to make informed Community assembly is a complex and dynamic process that shapes biodiversity across natural systems, emerging from the interplay between deterministic and stochastic mechanisms and widely studied in local plant communities. Among deterministic processes, environmental filtering acts through trait–environment matching, whereby abiotic constraints and biotic pressures determine which species can establish and persist in a given place and time. In fire-prone ecosystems, environmental filtering is strongly influenced by recurrent disturbances such as wildfires, whose frequency and intensity are expected to increase under ongoing climate change. Nevertheless, the relative roles of abiotic and biotic filters in shaping taxonomic, functional, and phylogenetic diversity across spatial gradients and along secondary succession remain poorly understood. We analysed seven Mediterranean shrubland localities along an altitudinal gradient (500–1300 m a.s.l.), encompassing early, intermediate, and advanced stages of secondary succession. Using Structural Equation Models, we evaluated how taxonomic, functional, and phylogenetic diversity respond to climatic, edaphic, and successional age variables. Diversity patterns were quantified using standard indices of diversity and dispersion across the three biodiversity dimensions. Our results show that taxonomic, functional, and phylogenetic diversity increase along secondary succession and toward warmer, drier conditions. Early stages were characterized by strong functional convergence and phylogenetic clustering, indicating dominant abiotic environmental filtering acting on specific traits and lineages. As succession progressed, abiotic filtering weakened and biotic interactions likely became more important, promoting greater trait dispersion and increased community complexity.

FOREST RESILIENCE AND ADAPTATION STRATEGIES UNDER CLIMATE CHANGE IN MEDITERRANEAN ECOSYSTEMS

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Keywords: Resilience, Trade-offs, Disturbance, Drought, Wildfire

In Mediterranean forests, rising temperatures and more frequent summer droughts and wildfires under climate change challenge the maintenance of ecosystem structure and function. Evidence from the literature on adaptation-focused forest management in Mediterranean ecosystems is synthesized and evaluated. A conceptual framework is outlined to classify management strategies and their ecosystem trade-offs. The synthesis reveals that most interventions focus on immediate risk reduction—for example, fuel management via thinning or prescribed burning to mitigate wildfire, or altering species composition and stand structure to buffer drought impacts—while much less attention is given to actions explicitly aimed at enhancing long-term ecosystem resilience. These short-term strategies often entail unintended trade-offs, for example negatively affecting biodiversity, water resources or carbon storage. Evidence of cumulative effects across multiple disturbances is sparse. The synthesis highlights key knowledge gaps: notably a lack of long-term field experiments and ecosystem-level studies, and uncertainty in balancing conflicting objectives. It underscores that future adaptation requires integrated approaches explicitly addressing ecological trade-offs and resilience across multiple objectives and timescales. This holistic perspective can inform policies and practices that align short-term interventions with long-term forest health and multiple ecosystem services. By acknowledging limitations of current evidence, this synthesis emphasizes the need for management strategies that maintain ecosystem resilience and integrity under escalating drought and wildfire risk in Mediterranean forests.

SHRUB PATCHES INFLUENCE PLANT SPECIES COMPOSITION AND BIOLOGICAL STRUCTURE IN POST MINING PASTURES

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Keywords: Genista-florida, life-history traits, mine reclamation, facilitation, floristic composition

Plant-to-plant interactions are key drivers of grassland community assembly, particularly in harsh and disturbed environments such as mining ecosystems. Given their importance, this study assesses the influence of shrub patches on species composition and biological structure of the plant community, in terms of the species composition of the understorey, and the abundance of families, life span, and Raunkiaer's life-forms, in post-mining pastures of northwestern Palencia. In spring 2024, the cover (%) of every vascular plant species was registered in eight 20 cm quadrats placed within and outside the canopy of five Genista florida patches. Additionally, total plant cover and moss cover were recorded, and soil moisture was measured with a handheld TDR soil humidity sensor (Hydrosense II) in the 80 quadrats sampled (5 patches x 2 positions x 8 quadrats). A detrended correspondence analysis (DCA) was used to identify the sources of variation in species composition, and the "envfit" function was used to test the significance of structural and compositional variables. The species composition differed significantly between positions (within vs. outside the shrub patches). Within shrub patches, Poaceae, Violaceae, and Rubiaceae increased cover and these communities are dominated by perennial herbs (hemicryptophytes) and woody species (chamaephytes and phanerophytes). These areas also showed higher soil moisture and moss cover. Outside, Plantaginaceae and Fabaceae were more abundant, while Asteraceae occurred in both positions. Open pastures exhibited greater vegetation cover dominated by therophytes/annual and biannual herbs (short life span). These findings underscore the role of shrub patches as keystone structures that enhance structural and compositional heterogeneity, contributing to biodiversity maintenance in degraded landscapes. We conclude that shrub patches shape plant community structure in post-mining pastures, highlighting their potential role in restoration and management strategies for these degraded ecosystems.
Funding: MICIU/AEI/10.13039/501100011033/FEDER-EU Project; Predoctoral contract CONTPR-2022-400; INVESTIGO-SEPE-2023 (CP23/178) and post-doctoral UVa-María-Zambrano

LONG-TERM EVOLUTION OF PINE AND OAK FOREST ACROSS THE MUNICIPALITIES OF THE "BOSQUE MODELO PALENCIA"

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Keywords: national forest Inventory, forest Map, dashboards, model Forest Network, forest management

"Bosque Modelo Palencia" (BMP) is an initiative that seeks to include 91 municipalities of Palencia, located between the Camino de Santiago and the Montaña Palentina Natural Park, within the International Model Forest Network. This network promotes bioeconomy and local participation through the management and conservation of forest resources. This study analyses the long-term evolution of the main pine (Pinus sylvestris, P. pinaster and P. nigra) and oak (Quercus pyrenaica, Q. faginea and Q. petraea) stands in the BMP by integrating multiple open national datasets. We use the three most recent editions of Spain's National Forest Inventory for Palencia province, NFI2 (1991), NFI3 (2003) and NFI4 (2021), together with the Spanish Forest Map at two scales, SFM50 (2003) and SFM25 (2021). While these datasets provide detailed information at tree, plot, stratum, patches and provincial scales, none offers direct municipal-level data. Such information is key for local forest management and stakeholder engagement within the BMP framework. To address this gap, we performed spatial analyses to quantify the area occupied by each forest stratum and by SFM patches in every municipality. We then integrated all spatial–temporal datasets using GIS and R to estimate forest stocks (trees/ha, m2/ha and m3/ha) and forest area per dominant species across the BMP municipalities. We also generated a set of visual outputs, such as graphs and tables, that facilitate the assessment of trends in forest area, carbon storage, stand quality, damage, forest structure and composition at the municipal scale. Overall, this work delivers a data-driven, reproducible dashboard that aims to supports multicriteria decision-making based on publicly available forest information. The results strengthen the capacity of local stakeholders to understand forest structure and long-term dynamic within the BMP and promote collaborative governance aligned with the principles of the Model Forest Network approach.

LEVERAGING PLANET IMAGERY AND LIDAR DATA FOR ENHANCED ESTIMATION OF WILD EDIBLE MUSHROOM YIELD

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Keywords GAM, NDVI, Planet imagery, Remote sensing, Soria, Structural variables

Wild edible mushrooms form ectomycorrhizal relationships with the forest and play a significant role in the economic and ecological functions of Mediterranean forest ecosystems. However, their annual yields are highly variable and difficult to predict due to climate variability, forest management, and fire events. Predictive modeling of their yields using remote sensing technologies is crucial for incorporating them into sustainable forest management. Therefore, this study aimed to evaluate the effectiveness of high-spatiotemporal-resolution Planet imagery and LiDAR data for modeling wild edible mushroom yields in P. pinaster and P. sylvestris forests in Soria, Spain. We used 7 years of mushroom yield data collected from P. pinaster and P. sylvestris forest stands. Seasonal multitemporal NDVI values derived from Planet imagery, climatic variables from the Spanish Agencia Estatal de Meteorología (AEMET), and forest structural variables obtained from LiDAR data were used as predictor variables. Prior to developing the models, we assessed variable importance using the Mean Decrease Accuracy (MDA) metric implemented in the Random Forest algorithm through Caret. Edible wild mushroom yield models were then built using Generalized Additive Models (GAM). We found that the difference in NDVI between autumn and summer (MDA = 13.54) was the most influential variable in estimating mushroom yields. The best predictive model for mushroom yield combined NDVI seasonal differences, average tree height, total precipitation over the past two years, and interaction terms between the NDVI difference and each of these variables (R2 = 0.64). These findings demonstrate the potential of integrating high-resolution remote sensing tools with in-situ data to effectively predict mushroom yield. Consequently, these results contribute significantly to assessing mushroom production and unlock the potential of non-wood forest products as integral elements of sustainable forest planning.

POSTER SESSION

UNLOCKING THE POTENTIAL OF PIG SLURRY: ASSESSING THE PERFORMANCE OF RECOVERED FERTILIZERS

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Key words: Ammonia recovery, Gas-permeable membranes, Manure-derived fertilizers, Ammonium sulfate, Maize germination

In this work, we evaluated manure-derived fertilizers obtained through gas permeable membrane (GPM) technology, specifically ammonium chloride and ammonium sulfate. The aim of the work was to compare the germination efficiency of corn seeds treated with these two GPM-recovered fertilizers against a commercial ammonium sulfate fertilizer. Four replicates of corn seeds were used per treatment, planted in peat moss and treated over a four-week period with specific applications that varied depending on the fertilizer used. Additionally, a control treatment with water was included in this work. The final results showed that the growth of the aerial part was the highest in the GPM recovered ammonium sulfate treatment, followed by the water treatment, then the commercial ammonium sulfate, and finally the ammonium chloride treatment. Regarding root development, the water control treatment showed the greatest growth, followed closely by the GPM recovered ammonium sulfate, while the commercial ammonium sulfate and ammonium

DIFFERENCES IN PATHOGENICITY AMONG Phytophthora SPECIES ON ALDER LEAVES

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Keywords: Biotechnology, Molecular biology, Necrosis, Oomycetes, PCR detection

Alder decline is a widespread and severe disease affecting Alnus spp. across Spain, primarily associated with pathogenic Phytophthora species. This oomycete-driven disease causes significant ecological and economic impacts in riparian forest ecosystems. Several Phytophthora species have been reported as causal agents of alder decline, although their relative pathogenicity remains insufficiently compared. In this study, the pathogenicity of four Phytophthora species isolated in Castilla y León (north-western Spain) by a forest pathology research group was evaluated on alder leaves: P. alni, P. plurivora, P. cambivora, and P. uniformis. Detached leaf assays were performed by inoculating agar plugs with actively growing mycelium onto wounded alder leaves placed in moist chambers. Inoculated leaves were incubated at 25 °C under a 12 h light/12 h dark photoperiod. Pathogenicity was assessed by measuring the radial length of necrotic lesions and calculating the mean necrotic area induced by each Phytophthora species. The presence of the inoculated oomycetes was confirmed by PCR amplification and sequencing, thereby verifying their role as the causal agents of the observed lesions. The results revealed marked differences in pathogenicity among the tested species. P. alni and P. plurivora showed significantly higher pathogenicity compared to P. cambivora and P. uniformis, with P. plurivora causing the largest necrotic areas, reaching up to 46.5 mm². These findings highlight the importance of comparative pathogenicity studies to better understand the potential impact of different Phytophthora species on alder health. The high pathogenicity of P. plurivora is of particular concern, given its relatively recent detection in Spain and its expansion is progressively increasing, and underscores the need for continued monitoring and risk assessment in forest ecosystems.

CANOPY STRUCTURE AND YIELD ESTIMATION IN QUERCUS PYRENAICA FORESTS USING PNOA AIRBORNE LIDAR

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Keywords: Forest modelling, Forest inventory, Pyrenean oak, Volume, Castilla y León

Accurate information on forest structure and yield is essential for sustainable forest management and ecological monitoring. Traditional field-based inventories provide reliable local measurements but are labour-intensive and spatially limited. In contrast, large-scale datasets such as the Spanish "Plan Nacional de Ortofotografía Aérea" (PNOA) offer several products like the nationwide airborne LiDAR coverage, representing a valuable resource for regional forest analysis. This study presents an ongoing methodological framework for estimating canopy structure and forest yield in Quercus pyrenaica (Pyrenean oak) forests across the Castilla y León region (Spain). The study area includes forest plots distributed across multiple locations and forest structures, aiming to represent the variability of Q. pyrenaica stands commonly found in the region. Field data consist of 40 circular plots, for which traditional forest inventory measurements and handheld laser scanner (HLS) LiDAR data were collected. Airborne LiDAR data from the second PNOA coverage corresponding to plot locations were processed using an open-source workflow. PNOA tiles were clipped to plot boundaries, noise was removed, ground points were classified, and point clouds were height normalised. Canopy structural.

ESTIMATION OF THE QUALITY OS STANDING CUPRESSUS ARIZONICA WOOD BY NDT METHODS

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Keywords: Non-invasive diagnostics, Timber characterization, In situ evaluation,Structural integrity, Physical–mechanical indicators

This project aims to evaluate the elastomechanical behaviour and wood quality of Cupressus arizonica using non-destructive testing (NDT) methods, specifically longitudinal ultrasound and longitudinal vibration (FFT). The study is conducted on 45-year-old trees growing in the Torozos forest of Ampudia (Palencia), a Mediterranean-continental site where the species was introduced in the mid-20th century for reforestation and soil protection. Cupressus arizonica, originally native to North America and adapted to dry and cold environments, has become naturalized in parts of Spain but remains understudied in terms of its physical and mechanical properties. The project seeks to quantify the longitudinal wave propagation velocity at different stages of the wood chain—in standing trees, freshly cut logs, and sawn timber—and to analyse variability between individuals, log heights, and measurement techniques. It also investigates the relationships between the dynamic modulus of elasticity obtained from NDT and the static modulus determined by bending tests following EN 408. The methodology involves ultrasound and vibration measurements on standing trees, followed by similar tests on logs and later on sawn pieces of 6 × 4 × 120 cm, which are subsequently tested in bending. Additional analyses include basic physical characterisation and observations of the microscopic structure of the species. The expected outcome is to assess whether measurements taken on standing trees can reliably predict the mechanical quality of the resulting sawn wood, to establish correlations between NDT-based indicators and structural performance, and ultimately to determine the overall quality of the tested Cupressus arizonica timber.

ON THE BIOLOGY OF THE IBERIAN BARBEL (LUCIOBARBUS BOCAGEI STEINDACHNER, 1864) IN THE MIDDLE REACH OF THE DUERO RIVER

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Keywords: Population dynamics, length–weight relationship, condition index, growth patterns, diet composition

This study presents the main biological parameters of the Iberian barbel (Luciobarbus bocagei), an endemic potamodromous cyprinid species representative of the Duero River in the Iberian Peninsula. The population was characterized through electrofishing surveys, between 2018 and 2025, in the vicinity of two fishways of the middle Duero River, in the province of Burgos (Spain). A total of 1366 specimens were collected, measured and weight. The analysis of the length–weight relationship revealed negative allometric growth ($b = 2.936$; $p < 0.0001$), indicating differential weight growth relative to length. The condition factor exhibited clear seasonal variations, with peaks coinciding with the pre-spawning period (late spring). Growth was modeled using the von Bertalanffy equation, revealing a growth coefficient (k) consistent with populations from similar Mediterranean river systems. In addition, a capture–mark–recapture program provided direct estimates of growth rates and movement patterns, detecting size increase only during spring and summer. Furthermore, trophic characterization based on stomach content analysis indicated that the Iberian barbel feeds predominantly on benthic invertebrates, particularly larvae of Trichoptera, followed by other orders of aquatic insects such as Diptera and Ephemeroptera. The consumption of plant material was also recorded but represented a secondary contribution to the diet. This information is fundamental for the development of effective conservation and management strategies for L. bocagei, a species of ecological and sport fishing interest in the Iberian Peninsula.

RAINFALL AS A MODULATOR OF RADIAL GROWTH AND PLANT PHENOLOGY IN A TROPICAL RIPARIAN FOREST

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Keywords: Cambial activity, dendrometers, seasonal dynamics, leaf phenophases, water availability

The relationship between climatic factors and tree growth is complex and varies according to region and species. In tropical and subtropical areas, seasonal variation in rainfall and temperature, together with photoperiod, plays an important role in explaining cambial activation in tree stems. In this study, we investigated radial growth and phenological phases of 16 tree species in a riparian forest in the Chapada Diamantina, Bahia, Brazil, over a two-year period (2023-2025). Rainfall and photoperiod data were collected and compared with monthly radial increment and phenological observations. Radial increment was monitored using band dendrometers (0.2 mm precision) to measure growth over time. In the same individuals, the phenophases of leaf flushing, leaf fall, flower buds, flowering, immature fruits, and mature fruits were recorded and quantified following the Fournier (1974) intensity classes. Radial growth and phenology showed strong seasonality, with growth peaks concentrated in the rainy season and high synchrony among species, reflecting regional climatic control over cambial activity. Leaf flushing occurred predominantly at the onset and throughout the rainy period and was positively correlated with radial growth, indicating that cambial reactivation is closely associated with the expansion of photosynthetic area. Spearman correlation analysis indicated a positive association between rainfall and leaf flushing ($p = 0.23$). In contrast, leaf fall was concentrated in the dry season, showed a negative association with radial growth, and was negatively correlated with rainfall ($p = -0.36$), suggesting physiological limitation imposed by water stress. Reproductive phenophases exhibited interspecific variation and weak relationships with radial growth, indicating differential allocation of resources between vegetative growth and reproduction, possibly related to pollinator availability and reduced competition for dispersers. These results demonstrate that rainfall acts as the main regulator of phenological dynamics and radial growth, modulating cambial activity through water availability and leaf dynamics.

EVALUATION OF FREQUENTIST GENOMIC PREDICTION MODELS FOR PINE NUT PRODUCTION IN PINUS PINEA

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Keywords: clonal identification, common-garden trial, genomic selection, SNP-array, tree breeding, yield improvement

Pine nuts from stone pine (Pinus pinea L.) constitute a food resource of high economic value in the Mediterranean Basin. However, breeding programs for this species have been hampered by very low genetic variation, both quantitative and molecular. In this context, the use of new genomic tools may enable the implementation of genomic selection strategies aimed at improving pine nut production. This study aims to assess the potential of genomic prediction for key traits related to pine nut production by comparing three methodological approaches: frequentist models, Bayesian models, and machine learning algorithms. A total of 248 clones from four different Spanish provenances, replicated across multiple common-garden trials, were genotyped using a commercial SNP array (5,671 markers) and phenotyped over several years. The traits analyzed were number of cones per ramet and average cone weight. Trait heritabilities were estimated for each common garden, and genomic prediction models were assessed using cross-validation with predictive ability quantified using Pearson and Spearman correlations, as well as root mean square error (RMSE). Our preliminary results focussing on the frequentist models only show low predictive ability for both traits and highlight a strong genotype × environment interaction, reflected in the variability of predictive correlations across common gardens. These results underscore the genetic complexity of reproductive traits in Pinus pinea and provide a basis for comparative evaluation with new Bayesian and machine-learning genomic prediction

DESIGN OF DNA PLASMIDS FOR FOREST AND PLANT PROTECTION

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Keywords: lRNA interference (RNAi), double-stranded RNA (dsRNA), plasmid engineering, transgenic bacteria, pathogen control.

Diseases caused by pathogens represent one of the main threats to agricultural and forest ecosystems, affecting both productivity and environmental sustainability. In recent years, RNA interference (RNAi)– based technology has emerged as an innovative and highly specific strategy for the control of these pathogens, as it allows the silencing of genes essential for their survival. However, the application of this technology requires the production of double-stranded RNA (dsRNA), a molecule that is not naturally found in higher organisms and must therefore be synthesized using biotechnological systems. To obtain dsRNA, it is necessary to use transgenic bacteria capable of producing this type of RNA from specifically designed genetic constructs. In this context, the present project focuses on the design and manipulation of DNA plasmids intended for dsRNA production in bacteria, as a preliminary step toward their potential application in the control of agricultural and forest pathogens. Through molecular biology techniques such as restriction enzyme digestion, ligation, and bacterial transformation, recombinant plasmids were constructed that allow the expression of sequences of interest. The results obtained, analyzed by agarose gel electrophoresis, confirm the correct manipulation of plasmid DNA and the viability of the experimental design. This work lays the groundwork for the development of RNAi-based biotechnological systems as a sustainable and specific alternative to traditional pathogen control methods in agricultural and forest environments

HOW TO OBSERVE SOILS OUTSIDE THE FIELD

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Keywords: Soil properties, monolith, teaching innovation, active learning.

Soil is a key component of forest and agricultural ecosystems, controlling productivity and regulating essential processes such as carbon sequestration, water dynamics, nutrient cycling and biodiversity support. However, the high spatial heterogeneity of soils often makes their comparative analysis difficult, particularly when different soil types, land uses or environmental conditions must be examined simultaneously. This contribution explores the scientific advantages of using real soil replicas—soil monoliths and mini-monoliths—as practical tools for the comparative study of soils under contrasting environmental and management contexts. These replicas preserve the structure of soil profiles and allow direct visual and physical inspection of horizons, texture, aggregation, organic matter distribution and structural features. Exhibitions side by side of intact soil profiles from different forest and agricultural systems allows to be analysed in a simple, efficient and reproducible way. This approach, combined with active learning activities, has been developed within the framework of a teaching innovation project supported by the Vice-Rectorate for Teaching Innovation and Digital Transformation of the Valladolid University. Once prepared, monoliths function as reference materials that support qualitative and semi quantitative comparisons, hypothesis generation and interpretation of physicochemical and biological data obtained from field and laboratory analyses. The availability of real soil replicas enhances the understanding of soil variability, improves the interpretation of soil properties, and supports integrative analyses across sites and soil types. The project aligns with international frameworks such as the UN Sustainable Development Goals (4 and 15) and the European Mission "A Soil Deal for Europe", highlighting the potential of active, inclusive and open educational practices to connect education, research and society in forest and soil sciences.

FOODTECH CHALLENGE: TURN FOOD WASTE INTO THE INGREDIENTS OF THE FUTURE

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Keywords: oat pulp, milk alternatives, by-product valorization, freeze-drying

The demand for plant-derived beverages intended to replace conventional milk has increased markedly in recent years, positioning oat-based drinks as one of the most prominent options. This rapid market expansion has inevitably resulted in the generation of oat pulp (OP), a by-product with a high moisture content. Far from constituting merely a waste stream, OP can be considered a valuable raw material to produce novel oat-based ingredients enriched in dietary fiber and proteins. Consequently, the present work investigates two distinct strategies to improve OP stability and assesses the functional properties of both the treated pulp and its corresponding source oat flour.

The oat pulp used in this research, with an initial moisture content of 65%, was dried in two separate ways: in a freeze-dryer or in a forced-air oven. The final moisture content of the two processes was low, and both samples were then milled into a fine powder in a laboratory-scale hammer mill. The outcome of the water binding capacity test showed that there no difference was found between the water absorption of oat pulp and oat flour, neither among the two different drying techniques. In order to continue discerning whether the different drying techniques affect the OP's functional characteristics, its particle size and viscosity will be studied. Once the pulp is characterized, it will be incorporated into a food matrix such as biscuits, whose properties will be evaluated.

This research will underscore the potential of oat pulp as a viable and sustainable ingredient for the cereal industry, while highlighting future opportunities for its industrial application through process optimization, product development, and further investigation into its functional and nutritional performance.

EFFECTS OF LANDSCAPE STRUCTURE ON RARE AND THREATENED TREE SPECIES IN A FRAGMENTED TROPICAL BASIN

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Keywords: forest fragmentation, Atlantic Forest, habitat amount, Doce River Basin, edge effects

The Atlantic Forest is one of the world's most biodiverse and threatened tropical biomes, currently reduced to a highly fragmented landscape. Within this context, the Doce River Basin (eastern Brazil) is a priority region for biodiversity conservation, harboring rare and threatened tree species that are often habitat-specialized and ecologically sensitive. We evaluated how landscape composition and configuration influence the richness and abundance of rare and threatened tree species across forest remnants in the basin. Tree occurrence and abundance data were compiled from published datasets and complemented with new field surveys. Field sampling was conducted in 22 forest fragments using 0.1 ha plots (20 × 50 m), recording all trees with circumference at breast height ≥ 15 cm. The final database comprised 60 plots, of which 53 contained at least one of the 26 threatened tree species selected according to forest phytophysiognomies identified by the Doce River Terrestrial Biodiversity Conservation Action Plan. Landscape metrics were calculated within buffers surrounding each plot and included forest cover (FC), edge density (ED), landscape shape index (LSI), patch density (PD), and mean Euclidean nearest-neighbor distance between forest patches (ENN). Models revealed contrasting responses of richness and abundance to landscape structure. Species richness increased with forest cover, suggesting that habitat amount primarily determines species occurrence. In contrast, abundance declined significantly with increasing forest isolation and edge density, while showing a marginal positive association with forest cover. Landscapes with lower edge density consistently supported higher abundances across isolation gradients, indicating that landscape configuration modulates fragmentation effects. These findings show that conserving rare tree species in fragmented tropical forests requires strategies that promote not only forest cover, but also connectivity and reduced edge complexity.

ADAPTIVE CROP COEFFICIENT MODELLING FOR EFFICIENT IRRIGATION MANAGEMENT IN MULTI CUT CROPS

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Keywords: Water use efficiency, Adaptive management, Crop water demand, Precision irrigation, Multi cut crops.

Water scarcity and rising energy costs in Mediterranean agriculture require more precise irrigation management tools. Conventional irrigation scheduling often relies on static FAO 56 crop coefficients, which do not represent the strong intra annual variability of multi cut crops such as alfalfa and can lead to systematic over irrigation outside peak summer conditions. This study presents an adaptive modelling framework to dynamically estimate the crop coefficient and improve water use efficiency within the food water energy balance. The approach was implemented in an alfalfa field in northern Spain monitored by the OASIS sensor network, combining meteorological data, soil moisture measurements and satellite information. Observed crop coefficients were derived from soil moisture depletion and compared with coefficients estimated from Sentinel 2 vegetation indices, confirming a clear seasonal pattern with lower values during spring and autumn regrowth cycles. To capture this variability, a novel harmonic model was developed to describe the seasonal evolution of FAO crop coefficient parameters as a continuous function of time. The proposed model reproduces observed crop water use dynamics while requiring limited local data and computational effort. This adaptive approach allows irrigation scheduling to be initialized with standard FAO values and progressively self calibrated as field data become available, providing a practical pathway to reduce water and energy consumption while maintaining crop productivity in multi harvest systems.

ASSESSMENT OF THE EUROPEAN WILDCAT (FELIS SILVESTRIS) STATUS VIA CAMERA TRAPPING IN THE URREZ SECTOR (BURGOS)

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Keywords: European wildcat (Felis silvestris), Camera trapping, Conservation status, Mesocarnivore, Burgos.

This research is part of the national project "Monitoring and Assessment of the Conservation Status of the Wildcat in Spain," coordinated by Bastet Conservation and Rey Juan Carlos University. The European wildcat (Felis silvestris) is a crucial mesocarnivore in Iberian ecosystems, yet its conservation is significantly threatened by habitat fragmentation and hybridization with domestic cats (Felis catus). This study aimed to confirm the species' presence and evaluate hybridization pressure within a specific forest area in the province of Burgos. The research was conducted over approximately 2,000 hectares near Urrez and Cabañas de Juarros, where twelve camera trap stations were installed in favorable locations such as streams and wildlife trails. These stations were arranged in a grid with approximately 1.7 km separation, facing North at a height of 30-50 cm, and utilized Iberian lynx urine as an olfactory attractant. The cameras remained active for a period of 53 days, from October 26 to December 18, 2025, with maintenance checks conducted every 15-20 days. The study successfully confirmed the presence of Felis silvestris, with positive captures recorded at four different stations (Cameras 3, 4, 5, and 8), indicating a spatial occupancy of 33%. Significantly, no domestic cats or apparent hybrids were detected during the entire sampling period. Additionally, the cameras revealed rich biodiversity, including high capture rates of Red fox (Vulpes vulpes), along with stone marten, genet, roe deer, wild boar, and occasional red deer. These results confirm that the Urrez Cabañas de Juarros area hosts an active wildcat population, validating the habitat's suitability. The total absence of free-ranging domestic cats suggests that hybridization pressure is currently low or null in this sector, which is a positive indicator for conservation. Finally, while the use of lynx urine proved effective, it is recommended that future studies utilize higher capacity SD cards to accommodate high wildlife traffic.

DISSECTING THE GENETIC ARCHITECTURE OF ULMUS MINOR'S RESISTANCE TO DUTCH ELM DISEASE.

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Keywords: QTL, Genomic Selection, PxG, Genetic Mapping, Ophiostoma.

Dutch elm disease (DED), caused by the fungal pathogen Ophiostoma novo-ulmi, has devastated populations of field elm (Ulmus minor) across European lands. Despite significant breeding efforts, the underlying genetic architecture conferring resistance remained largely unresolved. In this study, we conducted a quantitative trait loci (QTL) analysis using controlled crosses of U. minor to identify genomic regions associated with resistance to DED. Phenotypic and genotypic data were collected from 435 progeny individuals derived from three crosses involving three parental genotypes. The experimental population, derived from multiple families with varying but overall high resistance levels, was phenotyped for resistance through artificial inoculation in the fourth growth season. High-density SNP genotyping was performed using restriction site-associated DNA sequencing (RADseq), and a high-resolution genetic linkage map was constructed. The integration of phenotypic and genotypic data enabled the identification of QTLs associated with resistance-related traits across families. These findings enhanced our understanding of the polygenic nature of DED resistance in U. minor and provided molecular tools for marker-assisted and genomic selection. Moreover, this study shed light on the potential for pyramiding resistance alleles in future breeding programs and contributed to the ecological restoration of elm populations affected by DED.

URBAN TREES ALLOMETRY AND ECOSYSTEM SERVICES

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Keywords: LiDAR, Urban forestry, tree measurements, air temperature, carbon sink

Urban trees play a fundamental role in cities due to the numerous ecosystem services (ES) they provide, including climate regulation, air quality improvement, carbon sequestration, and social and landscape benefits. Although many of these services do not have a direct economic value, they are essential for human well-being. By analysing 10 representative trees from eight different species at the Palencia Campus (La Yutera), University of Valladolid, we insight on the contribution of urban trees to delivery two crucial ES: air temperature reduction and carbon sequestration. Each sample trees was measured (diameter at breast height and total height) following business as usual procedures (calliper and Vertex hypsometer) and scanned with handheld laser scanner. Individual trees laser point clouds were processed to obtain the total height, stem diameter and crown dimensions. Resulting dataset (traditional and laser-based measurements) was analysed using the free software R and its IDE (Rstudio). Used scripts are openly distributed to increase the opportunities to replicate our work. To obtain crown-based proxy variables related with temperature reduction and carbon sequestration. We use crown size as a proxy variable under the hypothesis that larger crowns provide (1) more shade, which means greater temperature reduction, and (2) more photosynthetic area, which facilitates greater tree growth potential, i.e., greater carbon sequestration. Crown surface area and crown volume were calculated and used as proxy of the considered ecosystem services.

EFFECT OF BIOCHAR AND FERTILIZER APPLICATION ON SOIL RESPIRATION AND MICROBIAL BIOMASS IN GRASSLAND AND SHRUBLAND SOILS

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Keywords: soil microbial activity, biochar, nutrient cycling, soil respiration, fertilization, grassland, shrubland.

Soil microbial activity is crucial for ecosystem funtioning as microorganisms mediate the decomposition of organic matter nutrient cycling, and the transformation and stabilization of soil organic matter.This activity regulates the availability of essential nutrients for plants and contributes to soil stability and fertility. It also influences carbon sequestration and CO2 release, a key process in climate change mitigation. Microbial biomass, which represents the total amount of living microorganisms in the soil, serves as an indicator of the "living mass" and reflects the system's capacity to carry out these biogeochemical processes. It is generally measured in terms of carbon, nitrogen, or phosphorus contained within the microorganisms. Soil respiration is often used as an indirect indicator (proxy) of microbial activity: higher respiration rates generally indicate higher activity, reflecting a greater capacity for decomposition and nutrient mineralization. The present study aims to evaluate whether different treatments applied to vegetation plots have a significant effect on soil respiration rates and microbial biomass. Two grassland and two shrubland soil samples were used for this purpose. In each plot, a control and three treatments were established: mineral fertilizer application, single-dose biochar application (0.5 L/m2), and triple-dose biochar application (1.5 L/m2). Analyses of soil respiration and microbial biomass allow assessment of how these treatments influence microbial activity and nutrient availability in the soil. We hypothesize that soils treated with biochar and fertilizer will exhibit higher microbial activity and increased biomass, reflecting a positive effect on soil fertility and health. This study provides relevant information about how soil management can modulate soil microbiota, optimizing nutrient mineralization and contributing to the sustainability of grassland and shrubland soils.
This work was supported by the Reactiva Brañosera project (BP220). Reactiva Brañosera is funded by the Biodiversity Foundation of the Ministry for Ecological Transition and the Demographic Challenge (MITECO) within the framework of the Recovery, Transformation, and Resilience Plan (PRTR), funded by the European Union – NextGenerationEU.

BIOLOGICAL CONTROL OF PLANT PATHOGENS BY THE USE OF ESSENTIAL OILS

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Keywords: Biocontrol, essential oil, fungal pathogen, in vitro

Opportunistic fungi affect numerous plant species both in the field and in harvested products. These diseases are difficult to control using chemical treatments. Their application is very limited, and their use is especially delicate in products intended for consumption. This study aimed to explore the antifungal capabilities of two essential oils from jasmine (Jasminum officinale) and Atlas cedar (Cedrus atlantica) against four necrotrophic fungal genera: Aspergillus, Cladosporium, Penicillium, and Fusarium. The current problem of food and plant rot caused by opportunistic fungi highlights the urgent need for natural, sustainable antifungal solutions. Essential oils, rich in bioactive compounds that can inhibit or slow down fungal growth without relying on synthetic chemicals, show great promise as natural antifungal agents. To assess their effectiveness, the essential oils were tested at three concentrations: 30 ppm, 300 ppm, and 3000 ppm. Each concentration and type of oil underwent three independent trials to ensure consistent data and reliable statistics. Additionally, as a control, three trials were conducted on PDA without essential oils, allowing for a direct comparison between the treated and untreated fungal strains. To record the effects of each treatment, measurements were taken over four weeks to monitor fungal growth progression. This timeline enables us to evaluate not just the short-term impact of the essential oils but also their long-term inhibitory potential. Growth curves for each fungus under every condition will be established using the collected data, helping us identify the most effective oil and concentration for each scenario. This research aims to assess the viability of these essential oils as potential antifungal agents and identify the combinations that yield the strongest inhibitory effects. The findings can be a further step towards application in sustainable biological control of fungal pathogens.

BIOLOGICAL ACTIVITY OF WINEMAKING SACCHAROMYCES YEASTS AGAINST PLANT PATHOGENS AND SEED GERMINATION

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Keywords: winemaking yeasts, antifungal effect, percent inhibition, seed germination

This study represents a continuation of research conducted during 2023–2024 on the sustainable valorization of vitivinicultural by-products, focusing on the use of beneficial microorganisms in horticulture. Considering the significant environmental impact of winery residues and the potential of fermented grape marc compost to improve soil quality, the research aimed to evaluate the antifungal and biostimulatory potential of yeasts belonging to the genus Saccharomyces, particularly S. cerevisiae. In vitro assays demonstrated a significant antifungal effect against major horticultural fungal pathogens, with complete inhibition observed for Botrytis cinerea and Sclerotinia spp. (PI 100%) at all tested concentrations (2.5%, 5%, and 10%). For Fusarium oxysporum and Alternaria spp., the antifungal effect was concentration dependent, with the highest inhibition recorded at 10% concentration (58.3% for Fusarium oxysporum and 67.1% for Alternaria spp.). Germination experiments conducted on Raphanus sativus seeds (cv. Johanna) demonstrated a significant influence of yeast treatments on seed germination and early plant development, with the best results obtained using lyophilized yeast on non-disinfected seeds (germination rate 92.5%, development index 2.68, vigor index 12.2, germination index 84.3). Overall, the results support the role of yeasts as effective biocontrol agents and biostimulants, providing a sustainable and environmentally friendly alternative to chemical inputs in horticulture.

MULTITEMPORAL ANALYSIS OF FOREST FIRE SEVERITY USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

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Keywords: fire, satellite imagery, perimeter, burn severity, post-fire management

Forest fires represent a growing threat to Mediterranean ecosystems, altering landscape structure and the provision of ecosystem services. Remote sensing using satellite imagery offers crucial tools for the rapid assessment of damage. The objective of this study is to apply spatial analysis techniques to delineate and quantify the severity of the fires in Candelario (Salamanca) and Ladrillar (Cáceres), both of which started on July 11, 2022, using Sentinel-2 satellite data (p. 2). QGIS software was used together with the Semi-Automatic Classification Plugin (SCP) to process pre and post-fire Sentinel-2 images (p. 2). The delineation of the affected area was carried out using two approaches: manual perimeter mapping by digitizing the visible contour in specific band combinations (12-8-3 and 12-11-8), and an automatic method (pp. 3, 7). The latter was based on the calculation of the differenced Normalized Burn Ratio (dNBR), identifying areas with severity values greater than 0.1, as shown in the generated vector layers (pp. 2, 4). In addition, the normalized burn severity index was calculated to provide a detailed assessment of damage intensity in each zone (pp. 5, 8). The Ladrillar fire affected approximately 3,323 hectares, while the Candelario fire exceeded 500 hectares, with initial estimates of up to 12,000 hectares for the former (p. 2). Visual band combinations allowed a clear distinction between healthy vegetation, burned areas, and bare soil. The dNBR analysis proved effective for the objective quantification of areas burned with high severity, outperforming manual delineation, particularly in areas of difficult access. Detailed burn severity index maps were generated for both events (pp. 5, 8). GIS and remote sensing methodologies are fundamental tools for post-fire management and forest restoration planning. The results obtained for the Ladrillar and Candelario fires enable a rapid and accurate assessment of fire severity, which is vital for informed decision-making regarding the recovery measures required in these ecosystems.

FUNCTIONAL DIVERSITY OF SOIL ENTOMOPATHOGENIC FUNGI ACROSS AN AGROFORESTRY MOSAIC ASSESSED BY BIOLOGICAL BAITING

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Keywords: Soil entomopathogenic fungi, biological baiting, agroforestry systems, natural biological control.

The widespread use of chemical pesticides has raised serious concerns regarding soil biodiversity loss and ecosystem sustainability, reinforcing the need for nature-based pest regulation strategies. Soil entomopathogenic fungi are key biological control agents, yet their functional diversity and real activity in Mediterranean agroforestry landscapes remain poorly characterized. This study evaluated the functional presence of entomopathogenic fungi in an agroforestry mosaic located in Monte del Rey (Palencia, Spain). Six ecosystem types were investigated: Quercus faginea oak forest, humid grassland, forest–cropland ecotone, no-tillage cropland, conventionally tilled cropland and Pinus halepensis reforestation stands. Four independent soil samples were collected per ecosystem during a single sampling campaign. Functional detection was carried out using biological baiting, exposing live Tenebrio molitor larvae to soil samples and recording mortality associated with fungal infection. Entomopathogenic fungi were isolated from mycosed larvae and identified through morphological and molecular approaches. Results revealed a strong ecosystem-driven pattern, with the highest functional diversity and infection rates observed in natural and semi-natural systems (oak forest, grassland and ecotone), intermediate values in no-tillage cropland, low values in tilled cropland and markedly reduced activity. Pinus halepensis reforestation soils. Beauveria bassiana was the most frequently isolated species across ecosystems. These findings highlight the value of biological baiting as a practical tool to assess functional entomopathogenic activity and emphasize the importance of forest and agroforestry systems as reservoirs of natural biological control, with direct implications for sustainable forest and agricultural management.

ENERGIES OF THE FUTURE FOR DOMESTIC SERVICES

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This essay is about what are the problems with energies that we are using nowadays and how can we solve them in the future, analyzing where do we get the energy we are using right now and proposing different alternatives for the future. In addition, I'm explaining this transition to a better energy plan, all geared toward domestic services, such as energy supplied to the home, whether for lighting, sockets, home automation, etc. In addition, to batteries for household items. Energy used for individual and/or family transportation, such as cars, motorcycles, and/or scooters, will also be explained. The goal is to change the today's plan to a renewable energy one, managing the few remaining non-renewable resources, because we can't instantly stop using them. To reach this goal, at least changing the energy resources that we use at home, we have to choose the best options of renevable resources to use, such as solar heat panels or wind power; find a way to store wasted energy from renewable resources and take advantage of some non-renevable resources during the process, like nuclear power.

A MULTIDISCIPLINARY EVALUATION OF URBAN TREE RESPONSES TO COMBINED HEAT AND WATER STRESS

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Keywords: Urban forestry, Heat waves, Drought stress, Oxidative stress, Thermotolerance.

The increase in global temperatures cause frequent and intense heat waves and droughts, especially in cities, where the temperature is higher than the surrounding areas, an effect known as the "Urban Heat Island" (UHI). Raising temperatures compromise most of the ecosystem services (ES) that urban tress provide including fixing carbon capacity or absorption of pollutants, among other. However, heat stress also increases vapor pressure deficit (VPD), which can in turn promote water stress, causing stomatal closure and oxidative stress, which compromise ES. Therefore, the objective of this study is to evaluate the mechanisms that allow some species to withstand elevated temperatures in combination with other environmental stresses, predominantly water stress. Our approach is multidisciplinary because includes the quantification of thermotolerance, gas exchange, energy balance, photochemistry, leaf and stem hydraulic properties and antioxidant capacity of the most representative tree species of Madrid. Sixty urban species were selected based on their abundance and those native species that are potentially more tolerant to the future climate of Madrid. The 60 species will be planted in pots in an experimental plot located at the National Institute for Agricultural and Food Research and Technology (INIA), where in situ measurements will be taken before, during and after the summer heat waves, and deficient irrigation will be applied to a subsample. Accordingly, this study aims to evaluate the mechanisms of acclimatization to high temperatures and drought, identifying the most relevant functional traits as indicators of tolerance to these stressors, and characterizing the most effective strategies for the mitigation of climate change in urban trees. This will enable the selection of the most resilient urban species to climate change; enhance ES provided by urban trees for citizens and propose advanced

THINNING IMPLICATIONS FOR QUANTIFYING COMPETITION:INSIGHTS FROM MEDITERRANEAN PINEWOOD

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Keywords: Natural resources, compositional data, statistics

Thinning is widely used to improve tree growth by reducing stand density and lowering the competition among trees. Because competition strongly influences how trees grow and how stands develop over time, understanding it is essential for planning management actions. However, the way we measure competition may not always work the same way before and after thinning, especially as the stand structure changes over time. In this study, we examined whether the most useful information to describe tree competition, such as the size of neighbouring trees, their species identity, or their position, changes between the short and long term after thinning. We tested this in a mixed Mediterranean pine stand (Pinus halepensis × Pinus pinea) in Ampudia (Castile and Leon, Spain), where three forest inventories allowed us to track how competition and growth evolved after thinning. Our results showed clear shifts over time. Just after thinning, trees were mainly affected by neighbours of the same species (intraspecific competition) and by how close those neighbours were (spatial information required). Over the long term, competition from other species became more relevant (interspecific competition), while the exact spatial position of neighbours became less important (spatial information not required). Across both periods, competition was driven mostly by trees that were clearly larger or smaller than the subject tree, rather than by the entire set of surrounding trees, regardless of their size. These findings clarify which aspects of competition matter most at different times after thinning, providing practical insights for developing new growth models for mixed Mediterranean pine stands and improving their use in simulation exercises.

CONVERSION OF DIGESTATECONTAINING HIGH LEVELS OF AMMONIA INTO A SUSTAINABLE FERTILIZER

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Keywords: Ammonia recovery, fertilizer, anaerobic digestion, digestate, gas-permeable membrane (GPM).

Despite the recognized importance of mushrooms in maintaining ecological Anaerobic digestion (AD) valorises organic waste into biogas. However, the high ammoniacal nitrogen content of digestate poses environmental and regulatory challenges, like acid rain, if not well treated. This study was aimed at investigating gas-permeable membrane (GPM) technology to recover ammonia from anaerobic digestate and produce an organic fertiliser that can assist in agriculture and livestock farming. Two identical experimental systems were simultaneously set-up and evaluated for 21 days. Each system consisted of two containers, one holding the digestate (1 liter) and the other holding an acidic solution (i.e. 0.25 L of sulphuric acid 1 N). Both containers were connected to each other by a GPM, designed to allow the exchange of ammonia without mixing the two liquids. A pump continuously drove the acid through the inside of the GPM and back to the acid container. The GPM was submerged in the digestate, allowing the transference of ammonia gas contained into the digestate to the acidic solution. Analyses of total ammonia nitrogen (TAN) and pH were performed every 3 days both in the digestates and in the acidic trapping solutions. An average percentage of 99.9% of TAN was removed from the anaerobic digestate, reducing the content from an initial amount of 7948 ± 681 mg TAN to a final residue of 65 ± 28 mg TAN. Regarding the capture process, 54.8% of the removed TAN was successfully recovered in the acidic trapping solutions, which corresponds to a total mass of 4358 ± 14901 mg TAN. The system achieved an average TAN recovery rate of 21.2 g/m² membrane/d, reaching a maximum peak of 101 g/m² membrane/d. Overall, the results obtained support the conclusion that the system was effective in reducing TAN in the digestate. At the same time, a sustainable fertilizer, which helps to reduce the risk of environmental impacts in agricultural systems, was produced.

MULTISCALE REMOTE SENSING TO ASSESS FOREST RESILIENCE AND PRODUCTIVITY IN PURE AND MIXED STANDS

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Keywords:remote sensing, field data integration, forest resilience, Sentinel-1, Sentinel-2

Remote sensing represents a key supporting tool for Climate-Smart Forestry, as it provides spatially explicit, temporally frequent, and up-to-date information on forest structure, condition, and dynamics. Within the framework of the RESPOND project (Resilience and productivity in pure and mixed forests: a multiscale analysis of vulnerability to disturbances). This study integrates multisensor satellite and drone-based data with detailed field measurements to assess forest resilience and productivity in pure and mixed stands of the Northern Iberian System range (Spain). Time series of optical imagery can be used to derive a set of vegetation- and moisture-related indices, while SAR data provide complementary information through backscatter coefficients sensitive to canopy structure and moisture conditions. Drone imagery supplies high-resolution information on canopy structure and spatial heterogeneity at the stand scale. These remotely sensed datasets are combined with extensive field data, including National Forest Inventory records, classical forest inventories, dendrochronological measurements from wood cores, and high-frequency in situ observations from a network of super- and minisites equipped with point dendrometers and soil moisture sensors. The multiscale integration of satellite, drone, and field data enables the linkage of physiological responses and growth dynamics at the tree and stand levels with landscape-scale patterns of productivity and disturbance response. By comparing pure and mixed forest stands, this approach aims to identify robust optical- and radar-based indicators of resilience to disturbances such as drought and extreme events. The resulting information supports the development of a Forest Digital Twin and the calibration of climate-sensitive growth models within RESPOND, contributing to data-driven and sustainable forest management strategies.

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Co-funded by the Erasmus+ Programme of the European Union
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