

PP1

Effect of electromagnetic fields (EMF) on biology, ecology and wellbeing of organisms

PP2

Nutrient recycling in tropical forests: termite ecology

PP3

Study of insect and fungi dynamics and tree species interaction

PP4

Reconstructing global insect invasion dynamics

PP5

Acquisition of productive, ecological, environmental and sociological data in forest environment

PP6

Forest dynamics models and global change research

PP7

Effects of the disturbance regime on forest ecosystem function in the context of climate change

PP8

Models of decision support as a preparation to Global Change and Industry 4.0

PP9

Novel wood-based materials related to GC and Industry 4.0

PP10

Research of horizontally Controlled Process Model in Relation to GC and Industry 4.0

## Key outputs



PP1

We showed that magnetic fields can provide mammals with a directional cue to synchronize and maintain their direction of movement. Alignment with magnetic field lines makes a cognitive map easier to read.



PP2

We figured out the relationships between microbial communities and xylophagous termites, including their coevolution. We uncovered the molecular basis of termite's ecological success. We identified a royal pheromone in higher termites.

PP3

The application of hydrogel during planting reduces the mortality of seedlings; we also found a higher rate of photosynthesis in oak seedlings. When applying hydrogel during planting, a differentiated approach is needed. The defence method of waxing (application of ecological wax to seedling stems) will protect the treated seedlings from damage by the large pine weevil at medium population densities.

PP4

We found that historical plant invasions are the main driver of insect invasions worldwide. Certain groups of insects are historically more prone to invasion, which is related to both their accidental global transmission and the biological characteristics that favour their establishment.

PP5

We created a digital twin of a real forest stand in virtual reality based on Lidar scanning. It can be used in psychological treatment as a tool for relaxation and emotional release.



## Key outputs

PP6

We expanded knowledge on the impact of climate change on Central European managed forests, including a critical review of the management possibilities of disturbance affected by climate change.

PP7

We confirmed the essential role of natural disturbance in the dynamics of natural forests. Natural disturbance fundamentally affects the ecosystem functions of natural forests. With its positive impact on the heterogeneity of the vegetation structure in space and time, it creates habitats for a whole range of organisms.

PP8

By monitoring the number of visitors to forests, we contributed to the creation of better forest management measures. Our software tool working with real LHP data implements research results to support multi-criteria decision-making (not only) in forestry. We helped to define the concept of forest bioeconomy and selected activities within it, and compare the state of bioeconomy in the Czech Republic with selected countries.

PP9

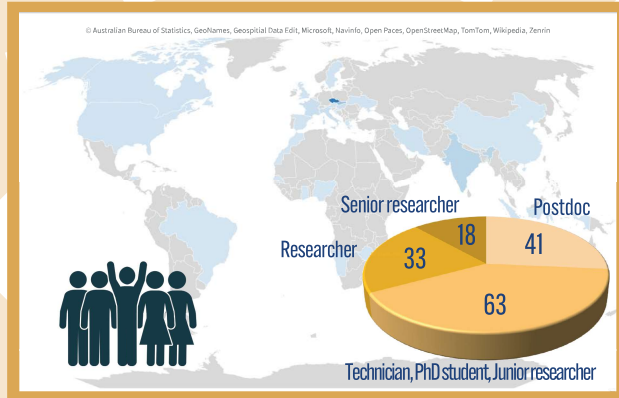
We developed an innovative paint system for the surface treatment of wood exterior, the development of which led to the filing of an international patent application.

PP10

We optimized laser cutting of wood and helped introduce laser technology into wood processing.



## The excellent team members



## Selected indicators

Professional publications created by supported entities

420+



International patent application



3

Professional publications with foreign co-authorship

300+



Centre of Excellence newly built



1

## Modern infrastructure

As part of building modern infrastructure, laboratories were renovated between 2017 and 2023 to a value of 28.7 million CZK and state-of-the-art equipment and machines were purchased to a value of 97 million CZK.

Among the most important equipment we can mention e.g. multispectral scanner with X-ray valued 20.2 million CZK.



## TOP publications of sub-programmes

1

Adámková, J., Benediktová, K., Svoboda, J., Bartos, L., Vynikalová, L., Nováková, P., Hart, V., et al., Turning preference in dogs: North attracts white south repels, *Plos One*, 2021, 16(1):15.  
Caspar, K. R., Moldenhauer, K., Moritz, R. E., Nemeč, P., Malkemper, E. P. and Begall, S., Eyes are essential for magnetoreception in a mammal, *Journal of the Royal Society Interface*, 2020, 17(170):8.

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Chakraborty, A., Sobotnik, J., Votýpková, K., Hradecký, J., Stiblík, P., Synek, J., Bourguignon, T., et al., Impact of Wood Age on Termite Microbial Assemblages, *Applied and Environmental Microbiology*, 2023, 89(5):16.  
Dolejšová, K., Krivánek, J., Stáfková, J., Horáček, N., Havlíčková, J., Roy, V., Kalinová, B., et al., Identification of a queen primer pheromone in higher termites, *Communications Biology*, 2022, 5(1):11.

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Holuša, J., Lubojacky, J., Curn, V., Tonka, T., Lukášová, K. and Horák, J., Combined effects of drought stress and *Armillaria* infection on tree mortality in Norway spruce plantations, *Forest Ecology and Management*, 2018, 427:434-445.  
Macháčová, M., Nakládal, O., Samek, M., Bata, D., Zumr, V. and Pešková, V., Oak Decline Caused by Biotic and Abiotic Factors in Central Europe: A Case Study from the Czech Republic, *Forests*, 2022, 13(8):22.

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Bonnamour, A., Blake, R. E., Liebhold, A. M., Nahrung, H. F., Roques, A., Turner, R. M., Yamanaka, T., et al., Historical plant introductions predict current insect invasions, *Proceedings of the National Academy of Sciences of the United States of America*, 2023, 120(24):7.  
Mally, R., Turner, R. M., Blake, R. E., Fenn-Moltu, G., Bertelsmeier, C., Brockerhoff, E. G., Hoare, R. J. B., et al., Moths and butterflies on alien shores: Global biogeography of non-native Lepidoptera, *Journal of Biogeography*, 2022, 49(8):1455-1468.

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Hejtmánek, L., Hula, M., Herrová, A. and Surový, P., Forest digital twin as a relaxation environment: A pilot study, *Frontiers in Virtual Reality*, 2022, 3:14.  
Panagiotidis, D., Abdollahnejad, A. and Slavík, M., 3D point cloud fusion from UAV and TLS to assess temperate managed forest structures, *International Journal of Applied Earth Observation and Geoinformation*, 2022, 112:12.

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Dobor, L., Hlásny, T., Rammer, W., Zimová, S., Barka, I. and Seidl, R., Is salvage logging effectively dampening bark beetle outbreaks and preserving forest carbon stocks?, *Journal of Applied Ecology*, 2020, 57(1):67-76.  
Hlásny, T., König, L., Krokene, P., Lindner, M., Montagné-Huck, C., Müller, J., Qin, H., et al., Bark Beetle Outbreaks in Europe: State of Knowledge and Ways Forward for Management, *Current Forestry Reports*, 2021, 7(3):138-165.

7

Mikolás, M., Svitok, M., Bace, R., Meigs, G. W., Keeton, W. S., Keith, H., Buechling, A., et al., Natural disturbance impacts on trade-offs and co-benefits of forest biodiversity and carbon, *Proceedings of the Royal Society B-Biological Sciences*, 2021, 288(1961):9.  
Mikolás, M., Ujházy, K., Jasik, M., Wieszik, M., Gallay, I., Polák, P., Vysoky, J., et al., Primary forest distribution and representation in a Central European landscape: Results of a large-scale field-based census, *Forest Ecology and Management*, 2019, 449:11.

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Hochmalová, M., Purwestri, R. C., Jian, Y. F., Jarsky, V., Riedl, M., Dian, Y. Y. and Hájek, M., Demand for forest ecosystem services: a comparison study in selected areas in the Czech Republic and China, *European Journal of Forest Research*, 2022, 141(5):867-886.  
Purwestri, R. C., Hájek, M., Hochmalová, M., Palátová, P., Huertas-Bernal, D. C., García-Jácome, S. P., Jarsky, V., et al., The role of Bioeconomy in the Czech national forest strategy: a comparison with Sweden, *International Forestry Review*, 2021, 23(4):492-510.

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Pánek, M., Simunková, K., Novák, D., Dvorák, O., Schönfelder, O., Sedivka, P. and Kobeticová, K., Caffeine and TiO<sub>2</sub> Nanoparticles Treatment of Spruce and Beech Wood for Increasing Transparent Coating Resistance against UV-Radiation and Mould Attacks, *Coatings*, 2020, 10(12):13.  
Zóltowska, S., Mitterpach, J., Sedivka, P., Jerousek, L. and Pánek, M., Outdoor efficacy of additional hydrophobic treatment of weathered wood by siloxane, *Construction and Building Materials*, 2022, 360:11.

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Ditommaso, G., Gaff, M., Kacik, F., Sikora, A., Sethy, A., Corleto, R., Razaei, F., et al., Interaction of technical and technological factors on qualitative and energy/ecological/economic indicators in the production and processing of thermally modified merbau wood, *Journal of Cleaner Production*, 2020, 252:12.  
Gaff, M., Cekovská, H., Bouček, J., Kaciková, D., Kubovský, I., Tribulová, T., Zhang, L. F., et al., Flammability Characteristics of Thermally Modified Meranti Wood Treated with Natural and Synthetic Fire Retardants, *Polymers*, 2021, 13(13):13.



Faculty of Forestry and Wood Sciences

## STRATEGIC PROJECT

# EVA4.0

Advanced Research Supporting the Forestry and Wood-processing Sector's Adaptation to Global Change and the 4th Industrial Revolution

CZ.02.1.01/0.0/0.0/16\_019/0000803



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