FORECOMON 2024

The 11th Forest Ecosystem Monitoring Conference

Monitoring for Future Forests

Conference Proceedings

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10-12 June 2024

Forestry and Game Management Research Institute

The Conference as well as the Task Force meeting is organized under the auspices of the Czech Ministers of Agriculture Marek Výborný and Environment Petr Hladík

MINISTRY OF AGRICULTURE OF THE CZECH REPUBLIC

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Dear members of the ICP Forests community, ladies and gentlemen,

I am very pleased and consider it a great honour that we can host the Task Force Meeting of ICP Forests in the Czech Republic for the third time. A lot of time has passed since one of the first meetings in Ústí nad Labem (1987). Over almost four decades, the programme has developed into the most comprehensive and harmonised pan-European network focused on long-term monitoring of forest ecosystems. A comprehensive set of evaluated parameters both on the regular level I network and on level II areas of intensive monitoring currently provides a lot of important information not only about the impact of air pollution on forest ecosystems. The data and methods obtained within the BioSoil project (2005-2008) serve as a basis for forest soil surveys in many countries and can be used as a basis for assessing changes in forest biodiversity. Information from continuous measurement of trunk circumference can help to explain trends in forest tree growth and forest production shown by the results of the National Forest Inventory, trends in soil moisture development can help to better understand the risk of climate change for forest tree species. I consider it welcomed and very beneficial that monitoring creates a unique set of information about the forest as a set of data for use in science and research. This demonstrates the legitimacy and necessity of forest monitoring, and its benefits for our society and, ultimately, for forests themselves. A lot of interesting information based on the long-term ICP Forests data series will be presented at the FORECOMON conference. I firmly believe that new information, new monitoring techniques and new scientific questions will help to further develop knowledge, develop cooperation and thus create better chances for our forests in the future.

I wish you a successful meeting and a pleasant stay in Prague.

Marek Výborný
Minister of Agriculture of the Czech Republic

Dear participants of the FORECOMON conference,

welcome to Prague, the capital of our country! It has been 39 years since the establishment of the ICP Forests program under the UNECE Convention on Long-Range Transboundary Air Pollution. As part of several international cooperative programs (including Waters, Materials, Vegetation, Integrated Monitoring, Modeling, Mapping, and Health), ICP Forests focuses on monitoring and adopting a science-based approach to understand the impact of air pollution on natural ecosystems, human society, and cultural heritage.

While air pollution has significantly decreased in Europe over the past four decades, its influence on forest health and production remains relevant. Fortunately, the historical decline in forests due to high sulfur dioxide concentration is behind us. Nowadays, the impact on ecosystems is more subtle, affecting nutrient and water cycles, altering biodiversity patterns, and intensifying stress in the face of changing climate conditions.

The complexity of dose-response effects necessitates long-term monitoring schemes and innovative methods. As the conference precedes the ICP Forest Task Force Meeting, I consider its main topics highly interesting and important. Wishing you an inspiring meeting!

Petr Hladík

Minister of the Environment of the Czech Republic

Programme

08:00 – 09:00 Registration & coffee

09:00 – 09:30 Opening / welcome

09:00 – 09:05 Opening of FORECOMON 2024

09:05 – 09:10 Welcome by host country, Czech Republic

09:10 – 09:15 Welcome by host institution, Forestry and Game Management Research Institute

09:15 – 09:20 Welcome by ICP Forests Chair

Session 1: Long-term forest ecosystem processes as affected by air pollution, drought or other extreme weather events

09:30 – 09:45 **D. Pitar et al.:** Air quality in European forests – ozone and nitrogen dioxide trends in the ICP Forests level II network

09:45 – 10:00 **J. Foest et al.:** Rising summer temperatures dampen masting of European beech (*Fagus sylvatica*) across range

10:00 – 10:15 **Y. Sun et al.:** Crown density, growth and carbon sequestration in European forests over the period 1990-2022

10:15 – 10:30 **H. Hartmann et al.:** Monitoring forest damage to shape Future Forests

10:30 – 11:00 **Coffee break**

11:00 – 11:30 **Poster pitch,** 19 posters, there is one minute for the poster presentation

11:30 – 11:40 **G. Delhaye et al.:** Spatiotemporal drivers of ectomycorrhizal diversity in Europe

11:40 – 11:50 **P. Žemaitis et al.:** Norway spruce health and vulnerability in Lithuania – wind, decay and *Ips typographus* as the main drivers

11:50 – 12:00 **P. Krám et al.:** Soil water dissolved organic carbon patterns at spruce sites with geochemically contrasting substrate in the last three decades

12:00 – 12:10 **S. Etzold et al.:** 25 years of forest growth in Swiss Level II plots

12:10 – 12:20 **T. Dirnböck et al.:** Multi-decadal drought and disturbance effects on forest carbon sequestration in a mountain forest landscape

12:20 – 12:30 **Further questions to all session 1 speakers**

12:30 – 13:30 **Lunch**

Session 2: Novel monitoring approaches to support the development of resilient forests

13:30 – 13:45 **R. Shackleton et al.:** Towards Advanced Forest Inventory and Monitoring (AIM): a Swiss example

13:45 – 14:00 **C. Guidi et al.:** From litter to soil carbon - harmonizing soil carbon stock estimates for a common European forest monitoring system

14:00 – 14:15 **R. Guerrieri et al.:** Quantifying tree canopy nitrification across European forests by combining stable isotope and molecular analyses

14:15 – 14:30 **M. A. Anthony:** From soils to canopy: a call to collaborate to disclose foliar microbiome diversity and function

14:30 – 15:00 **Poster pitch,** 13 posters, there is one minute for the poster presentation

15:00 – 15:30 **Coffee break**

15:30 – 15:40 **J. Černý et al.:** Optimisation of the measurement design for precise Green Leaf Area Index (GLAI) estimation by gap fraction methods in mature Norway spruce stands

15:50 – 16:00 **A. Principe et al.:** Scaling up tree mortality and survival in Mediterranean oak woodlands

16:00 – 16:10 **T. Molnár et al.:** Satellite-based forest health survey on ICP Forest Level II plots in Hungary

16:10 – 16:20 **E. Gril et al.:** Forest microclimate: how to quantify and predict the temperature buffering capacity of canopies

16:20 – 16:30 **N. Knapp et al.:** From single trees to country-wide maps: modeling tree mortality across Germany based on Level I data

16:30 – 16:40 **Further questions to all session 2 speakers**

16:40 – 17:00 **Mentimeter survey – and end of orals**

17:00 – 18:00 Poster session with refreshments

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Posters

Session 1: Long-term forest ecosystem processes as affected by air pollution, drought or other extreme weather events

1. **Buculei et al.:** Assessment of atmospheric deposition in context of climate warming in Romanian forest ecosystems
2. **Cuciurean et al.:** Phenophase dynamics of European beech and sessile oak in the intensive forest monitoring plot of Mihăești, part of the Level II ICP Forests network
3. **Damnjanović et al.:** Changes in forest floor P availability in an unmanaged mountain spruce forest after bark beetle-induced tree dieback: a 15-years study from Šumava mountains
4. **Fadrhonsová et al.:** Development of soil chemistry on Level II plots in the Czech Republic
5. **Galić et al.:** First data of carbon dioxide (CO_2) emission from soil in two Level II monitoring plot in Serbia
6. **Gottardini et al.:** Pollen deposition in throughfall samples at sixty ICP Forests plots throughout Europe
7. **Göttlein et al.:** 35 years of monitoring at „Höglwald“ - documentation of chemical climate change and its impact on the ecosystem
8. **Ingerslev et al.:** Temporal trends in nitrogen and sulfur throughfall fluxes and soil solution concentrations
9. **Kaňa et al.:** Changes in soil phosphorus availability in unmanaged spruce forest after bark beetle attack – from dieback to recovery
10. **Marra et al.:** Investigate the effect of soil water depth on ozone-induced visual foliar injury
11. **Nikagolla et al.:** On the relationship between forest status following bark-beetle disturbance and mineral nitrogen in soils of unmanaged mountain catchments: long-term in situ monitoring
12. **Pitar et al.:** Measured vs modelled: ozone concentrations in the Romanian forest plots (ICP-Forests Level II and LTER)
13. **Popa et al.:** Intra-annual tree growth patterns in level II ICP Forests plots from Romania
14. **Rybár et al.:** Development of mortality rates in Carpathian temperate forests
15. **Smart et al.:** Fifty years of change across forest ecosystems in Britain: a story of interacting drivers and historical legacy effects
16. **Tahovská et al.:** Response of soil microbes to long-term nitrogen input in spruce forest: results from Gårdsjön whole catchment N-addition experiment
17. **van Straaten et al.:** Transformation of forest humus forms in northwest Germany across three decades
18. **Wohlgemuth et al.:** Environmental impacts on foliar nutrient trends of ICP Forests Level II data
19. **Zolles et al.:** Analysis of the effects of soil parameters on radial stem growth for four spruce stands in Austria

Session 2: Novel monitoring approaches to support the development of resilient forests

20. **Češljar et al.**: Identification of the decline of individual trees due to the impact of drought using a database (Defoliation) as a „health card“ of previous events
21. **Fririon et al.:** can silviculture foster forest genetic evolution? A demo-genetic modelling approach accounting for within-stand individual variability estimated from ICP forest data
22. **Gollobich et al.:** Comparison of open land precipitation regimes with forest stand precipitation regimes and calculation of interception rates on the ICP-forest core plot „Klausenleopoldsdorf“
23. **Hůnová et al.:** Ambient ozone behaviour near the ground: Insight into seven-year continuous measurements at a rural Central European site tall tower
24. **Korakaki et al.:** Chlorophyll contents and their relationships with nutrients and δ13C
25. **Krasylenko et al.:** Monitoring of the European mistletoe distribution based on remote sensing data
26. **Lukovic et al.:** AI-assisted time-series analysis
27. **Mc Kenna et al.:** Investigating the relationship between crown defoliation and remote sensing indicators of vitality at the single tree level
28. **Meusburger et al.:** How can water isotopes improve predictions of the water balance
29. **Michopoulos et al.:** Arsenic and cadmium in the hydrological cycle and soil in a maquis broadleaved evergreen forest stand in Greece. Sources of some uncertainties
30. **Novotný et al.:** Impacts of ground-level ozone on vegetation in Czechia – assessment using visible foliar symptoms, AOT40F and MDA
31. **Schmitz et al.:** Underestimation of potassium in forest dry deposition? – A simulation experiment in rural Germany
32. **Vejpustková et al.:** Monitoring of tree growth with different types of dendrometers
33. **Zink et al.:** The International Soil Moisture Network (ISMN): providing a permanent service for environmental assessments

Identification of the decline of individual trees due to the impact of drought using a database (Defoliation) as a „health card“ of previous events

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Long-term droughts have long been proven to have a major negative impact on individual trees and entire forest ecosystems. One of the first signs of these impacts is seen as an increase in defoliation. Defoliation, as a term referring to missing leaf mass, aims to indicate changes in tree metabolism, which over time can prove to be an excellent „health card“ of a tree. By looking at the chronology (database), we can accurately determine the „trigger“, i.e. time of onset of increased defoliation through follow-up years. By continuously monitoring certain trees, we saw the appearance of three different groups of defoliation and classified them all into the category with the final result of decline due to the impact of drought. Group I - Defoliation that gradually increased during the drought, and after a few years that decline occurred. Group II - Defoliation as a sudden phenomenon with complete loss of assimilation organs and the final outcome of decline. Group III - Defoliation in trees that for many years had higher percentages of defoliation and after a number of years stimulated by drought, decline occurred. These three groups of recorded defoliations are intended to show the different effects of the dry period on the trees. Each tree is an individual by itself and most often reacts in relation to its current condition, which in the drought period usually refers to the inability to absorb the necessary water from the soil. If the final result of decline, regardless of the separated group, occurs in the same time interval, we can come to the conclusion that the drought was the one that started and ended this phenomenon. Also, if a large number of decline trees (defoliation 100%) is registered during or after recorded extreme climatic events, then this is another excellent indicator of the effect of drought on defoliation and the ultimate cause of decline. Therefore, continuous monitoring of defoliation can be a key tool for understanding the processes occurring in forest ecosystems.

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