



Conference Abstract

Mixed coniferous hemi-boreal forest understory vegetation long-term monitoring data analysis. Similarities versus peculiarities.

Ainis Pivoras[‡], Daiva Patalauskaitė[§], Ilona Jokoniene[|], Algirdas Augustaitis[¶]

[‡] Vytautas Magnus university, Utena, Lithuania

[§] State Service for Protected Areas, Vilnius, Lithuania

[|] Nature research centre, Vilnius, Lithuania

[¶] Vytautas Magnus university, Kaunas, Lithuania

Corresponding author: Ainis Pivoras (ainis.pivoras@vdu.lt)

Received: 21 May 2025 | Published: 02 Jun 2025

Citation: Pivoras A, Patalauskaitė D, Jokoniene I, Augustaitis A (2025) Mixed coniferous hemi-boreal forest understory vegetation long-term monitoring data analysis. Similarities versus peculiarities. ARPHA Conference Abstracts 8: e159729. <https://doi.org/10.3897/aca.8.e159729>

Abstract

Ground vegetation is a major component of forest ecosystems. Its composition, diversity, and structure are important factors determining the biological diversity of forest ecosystems. Since the ecosystem is a very complex system, the impact of climate change, meteorological extremes or air pollution is dispersed through all ecosystem components. A change in one parameter inevitably affects the others. The strongest composition and coverage fluctuations within herbs and moss layers are mainly determined by the composition and structure of habitat edificators – trees. The changes of separate understory species and whole-layer coverage are related to the conditions of the tree canopy and the succession stage of the stand. Climate change, meteorological extremes and chemical pollution-induced risks, firstly strike the homeostasis of dominant trees, when some of the trees die off, the microclimatic characteristics of the stands change drastically, inducing significant fluctuations within lower layers of vegetation. Yet long-term data analysis indicates that meteorology-related ground-level vegetation reactions also manifest, so climate change-induced effects on ground vegetation can indirectly affect the homeostasis of the whole stand.

Long-term (1993-2024) forest understory vegetation monitoring data collected under the ICP IM program in 3 different old-growth forest stands in Lithuania were analyzed. The effect of main meteorological parameters on the dominant herbs and mosses coverage was assessed.

Norway spruce-dominated (Z) and Scots pine-dominated (A1) stands were located on relatively dry, oligotrophic haplic arenosols. The third (A2) stand, is pretty equally covered with Norway spruce, Scots pine and Silver birch, and in contrast to A1 and Z located on wet, water-saturated, meso-eutrophic, terric histosol with groundwater connection at about 50 cm. In the A2 polygon after the death of part of the dominant trees in 2010, a dense spruce undergrowth is formed, displacing the vegetation of the lower layers of herbs and mosses. In other polygons (A1, Z), in contrast to the A2 polygon, no big-scale die-off within the tree layer was registered, and the ground vegetation communities of herbs and mosses remained pretty constant throughout the investigation period.

In Spruce-dominated forest stand (Z), while the majority of dominant understory species demonstrated a positive correlation with an increase in annual rainfall, soil and air temperatures, *Maianthemum bifolium* and *Pleurozium schreberi* demonstrate quite an opposite reaction. Indicating its highest vulnerability. An absolute herb-level dominant *Vaccinium myrtillus* coverage is positively related to the general coverage of the moss layer, especially *Plagomnium affine* and *Hylocomium splendens*. Yet coverage of an absolute moss layer dominant *Hylocomium splendens* significantly negatively correlated with the most sensitive of dominant herb species *Maianthemum bifolium*.

In the Pine-dominated A1 stand, likewise in the Z stand only *Pleurozium schreberi* and *Goodyera repens* demonstrate negative species coverage correlation with an increase in annual precipitation and monthly temperature, in opposition to the rest dominant species. Interestingly, an absolute herb layer dominant *Vaccinium myrtillus* coverage has a significantly positive correlation with rainfall during June, but a negative correlation with air humidity in May. Also registered a rising soil temperature positive effect for *Melampyrum pratense* and *Ptilium crista-castrensis* coverage. In contrast to Z stand, *Vaccinium myrtillus* coverage was more related to *Ptilium crista-castrensis*, not *Hylocomium splendens* coverage.

Mixed A2 forest, located on organic-rich, water-saturated peat soil, currently is distinguished by thick spruce undergrowth, and herbs and moss layer in many sample plots are poor. In contrast to Z and A1 polygons, the dominant of the remained species indicates quite an opposite pattern compared with previous stands. The rise in annual rainfall also soil and air temperature have a negative correlation with the coverage of the herbs layer. The moss layer coverage has no or low correlation to changes in annual rainfall, yet a significant positive correlation with air humidity was indicated.

Overall, the analysis allows us to indicate some species-specific patterns, their stand structure, composition and meteorology-related peculiarities.

Keywords

vegetation change, under canopy vegetation, long-term monitoring, plant-climate interaction, Aukstaitija integrated monitoring station

Presenting author

Ainis Pivoras

Presented at

POSTER

Funding program

This research has received funding from Horizon Europe Framework Programme (HORIZON), called Teaming for Excellence (HORIZON-WIDERA-2022-ACCESS-01-two-stage)—Creation of the Center of excellence in smart forestry “Forest 4.0” No. 101,059,985—and co-funded by the European Union under the project “FOREST 4.0—Center of excellence for the development of a sustainable forest bioeconomy”, No. 10-042-P-0002.

Hosting institution

Vytautas Magnus university

Conflicts of interest

The authors have declared that no competing interests exist.