

Major results/highlights

Two Level II plots (11-Mondsee, 17-Jochberg) were damaged by heavy snow in 2019 and were successfully reconditioned. Old deposition collectors will be renewed in 2021 at all sites. The results of the measurements and the chemical analyses on the Austrian level II plots can be seen at: www.waldmonitoring.at

Publications/reports published with regard to ICP Forests data and/or plots and not listed in Chapter 2

Level II data was used in combination with data obtained by the Austrian bioindicator network to analyse mercury discharge in forests. At the Level II plots the obtained values were between 0.07-0.32 g/ha*yr, corresponding to a value of 750 kg Hg/yr over Austria. A corresponding article titled "Der Wald als Quecksilbersenke" was published in the journal "Forstzeitung"¹.

Moreover, Level II data contributed significantly to an updated national evaluation of indicators for sustainable forest management on behalf of the Austrian forest dialogue (BMLRT 2020²). Here, the deposition of aerial contaminants and the leaf area index as indicator for crown damages have been reported.

In June 2021, an analysis using meteorological as well as phenological measurements obtained at the Level II plot in Klausen Leopoldsdorf was presented at the 9th Forest Ecosystem Monitoring Conference (FORECOMON) and was also submitted to the special issue on *Forest Monitoring to assess Forest Functioning under Air Pollution and Climate Change* with Frontiers.

Outlook

The monitoring activities on the 16 plots will be continued on a similar level as within the past years. This includes regular investment in measurement facilities and replacement of broken equipment.

The 6 core-monitoring plots are included in the network of sites for monitoring the negative impacts of air pollution upon ecosystems under the National Emissions Ceilings (NEC) Directive (2016/2284/EU). These plots will form the basis for collecting and reporting the information concerning forest ecosystems required under the NEC Directive.

¹ Fürst A, Tatzber M (2020) Der Wald als Quecksilbersenke, Forstzeitung 10, p. 26

² Linser S (2020) Indikatoren für nachhaltige Waldbewirtschaftung. Bundesministerium für Landwirtschaft, Regionen u. Tourismus (BMLRT), Vienna, 290 p. <https://info.bmlrt.gv.at/dam/jcr:2d25b3e7-8f0c-4556-8041-0c84f8741746/Indikatoren%20f%C3%BCr%20nachhaltige%20Waldbewirtschaftung%202020.pdf>

Belgium Flanders

National Focal Centre

Peter Roskams (until 31-08-2021), Arne Verstraeten
Research Institute for Nature and Forest (INBO)

Main activities/developments

In 2020, we were confronted with temporary lockdowns as the result of the COVID-19 pandemic. The capacity of our laboratory was heavily restricted, which led to delays in the analysis of samples, possibly affecting data quality. The impact of the lockdowns on the execution of fieldwork was, however, very limited.

A poster on long-term trends in ozone concentrations, indices and fluxes above a suburban mixed forest was presented at the 33rd Task Force Meeting of the UNECE ICP Vegetation in Riga. Another poster on the impact of pollen on throughfall biochemistry in European temperate and boreal forests was presented at the EGU2020 Sharing Geosciences Online Conference.

The Level I survey was performed on 73 plots and 1474 sample trees (4x4 km-grid). 826 broadleaves and 648 conifers were assessed. The main tree species are *Pinus sylvestris* (n=486), *Quercus robur* (n=390), *Pinus nigra* subsp. *laricio* (n=155), *Fagus sylvatica* (n=116) and *Quercus rubra* (n=93). Other broadleaved species, like *Castanea sativa*, *Quercus petraea*, *Betula pendula*, *Fraxinus excelsior*, *Alnus glutinosa*, *Acer pseudoplatanus* and *Populus sp.*, are gathered in the subset 'other broadleaves' (n=227). There are almost no other conifer species in the sample (n=7).

Major results/highlights

In Level I, mean defoliation was 24.1%, with 25.3% of the trees considered damaged. The mortality rate was 0.7%. The share of trees showing more than 25% defoliation was high in *Fagus sylvatica* (33.7%), *Quercus robur* (30.1%), *Pinus nigra* (30.3%) and 'other broadleaves' (32.2%). The share of trees in defoliation classes 2-4 was lower in *Pinus sylvestris* (16.2%) and *Quercus rubra* (16.1%).

In nine plots, trees were removed from the sample after a storm (n=20). Weather circumstances were warm and dry during spring and summer, with a long-lasting heat wave in August. Seed production was successful in *Quercus robur* and *Fagus sylvatica*. The proportion of trees with moderate to high fructification was 20.5% in *Quercus robur* and 14.7% in *Fagus sylvatica*.

On 7.1% of the trees, more than 10% of the crown showed discoloration. Damage due to defoliators was observed on 6.6% of the sample trees, most frequently on *Quercus robur*. Defoliators caused more than 10% defoliation on 22.8% of the *Q. robur* trees. The number of plots with caterpillar nests of

Thaumetopoea processionea on *Q. robur* increased compared to the previous year.

Crown condition deteriorated compared to the previous year. Mean defoliation increased significantly in *Fagus sylvatica* (+4.6 percentage points) and 'other broadleaves' (+2.0 percentage points). Significant changes were also detected for the total of broadleaves (+1.1 percentage points), conifers (+0.9 percentage points) and the overall total (+1.0 percentage points). *Quercus rubra* was the only species with a significant improvement in crown condition (-3.6 percentage points).

A precipitation deficit during the vegetation period in 2018, 2019 and 2020 caused drought symptoms. Crown deterioration and tree death was observed, often in combination with symptoms of insect damage or fungal infection, but mostly in forest stands outside the Level I survey. Damage was observed both in conifers (*Picea sp.*, *Pinus sp.*) and broadleaved species (*Fagus sylvatica*, *Acer pseudoplatanus*).

Compared to the very dry year of 2018, defoliation was significantly higher in *Quercus robur*, *Pinus sylvestris* and the 'other broadleaves'. The share of trees with more than 25% defoliation increased yearly in *Quercus robur*.

In 2014 a survey on the condition of *Fraxinus excelsior* was started, partly on Level I plots. A high proportion of trees is affected by *Hymenoscyphus fraxineus*. The share of trees with signs of *Armillaria sp.* or other wood rotting fungi increased every year. On a sample of 252 ash trees, 60.3% were classified as damaged, including 20.6% dead trees. Mean defoliation was 49.6%, dead trees included.

Publications/reports published with regard to ICP Forests data and/or plots and not listed in Chapter 2

Neiryck J, Verstraeten A (2020) Long-Term Trends In Ozone Concentrations, Indices And Fluxes Above A Suburban Mixed Forest. Poster presented at the 33rd Task Force Meeting of the UNECE ICP Vegetation, 27–30 January 2020, Riga, Latvia. [https://pureportal.inbo.be/portal/en/publications/longterm-trends-in-ozone-concentrations-indices-and-fluxes-above-a-suburban-mixed-forest\(c60172e8-bd2d-465b-a640-f5f4ebee22d4\).html](https://pureportal.inbo.be/portal/en/publications/longterm-trends-in-ozone-concentrations-indices-and-fluxes-above-a-suburban-mixed-forest(c60172e8-bd2d-465b-a640-f5f4ebee22d4).html)

Sioen G, Verschelde P, Roskams P (2020) Bosvitaliteitsinventaris 2019. Results of the crown condition survey (Level I). Research Institute for Nature and Forest, Report 2020 (20). INBO, Brussels (in Dutch). ISSN:1782-9054, DOI:doi.org/10.21436/inbor.18050253 https://pureportal.inbo.be/portal/files/18188072/Sioen_Verschelde_Roskams_2020_Bosvitaliteitsinventaris2019.pdf

Sioen G, Verschelde P, De Haeck A, Roskams P, Steenackers M, De Cuyper B (2020) The condition of ash (*Fraxinus excelsior*) in Belgium/Flanders. Results from a 2014-2019 common tree sample. Research Institute for Nature and Forest, Report 2020 (51). INBO, Brussels (in Dutch). ISSN: 1782-9054, DOI:[10.21436/inbor.19362850](https://doi.org/10.21436/inbor.19362850)

https://purews.inbo.be/ws/portalfiles/portal/29407284/Sioen_et_al_2020_DeGezondheidstoestandVanEsInVlaamseBossen.pdf
Verstraeten A, Gottardini E, Bruffaerts N, et al (2020) Poster presented at the EGU2020: Sharing Geosciences Online Conference, 4–8 May 2020. Impact of pollen on throughfall biochemistry in European temperate and boreal forests. <https://doi.org/10.5194/egusphere-egu2020-12994>

Outlook

The Level I and the Level II programs will be continued, as well as the additional survey on the condition of *Fraxinus excelsior*.

Belgium Wallonia

National Focal Centre

Elodie Bay, SPW – Public Service of Wallonia

Main activities/developments

In 2020, data were collected in eight plots for Level II/III and in 48 plots for Level I.

Major results/highlights

The species began their growing season at the usual dates, except for spruce which had an early budburst. A generalized freezing occurred on 12 May and injured a lot of shoots. The spring climate was quite dry for trees and they had to face a severe heat wave during the summer. Climatic trends have normalized in the autumn. The development of insects was favored. We list some species-specific tendencies as follows:

- Spruce and Douglas-fir had to face serious insect damage, respectively by *Ips typographus* and by *Contarinia pseudotsugae*. Some more spruces of the network had to be cut down.
- The degraded status of beech is maintained. Since 2016, the average defoliation (fructification effect deducted) has increased from 35% to 40%.
- The average defoliation of oak is slightly decreasing, and spring damage due to defoliating caterpillars is decreasing. *Thaumetopoea processionea* has been identified in many places in Wallonia but not yet in the network.
- Larches have been added to the network in 2019. Their average defoliation reaches 40%.