



Forestry and  
Game Management  
Research Institute

# Forest soil surveys and Forest soil research within FGMRI

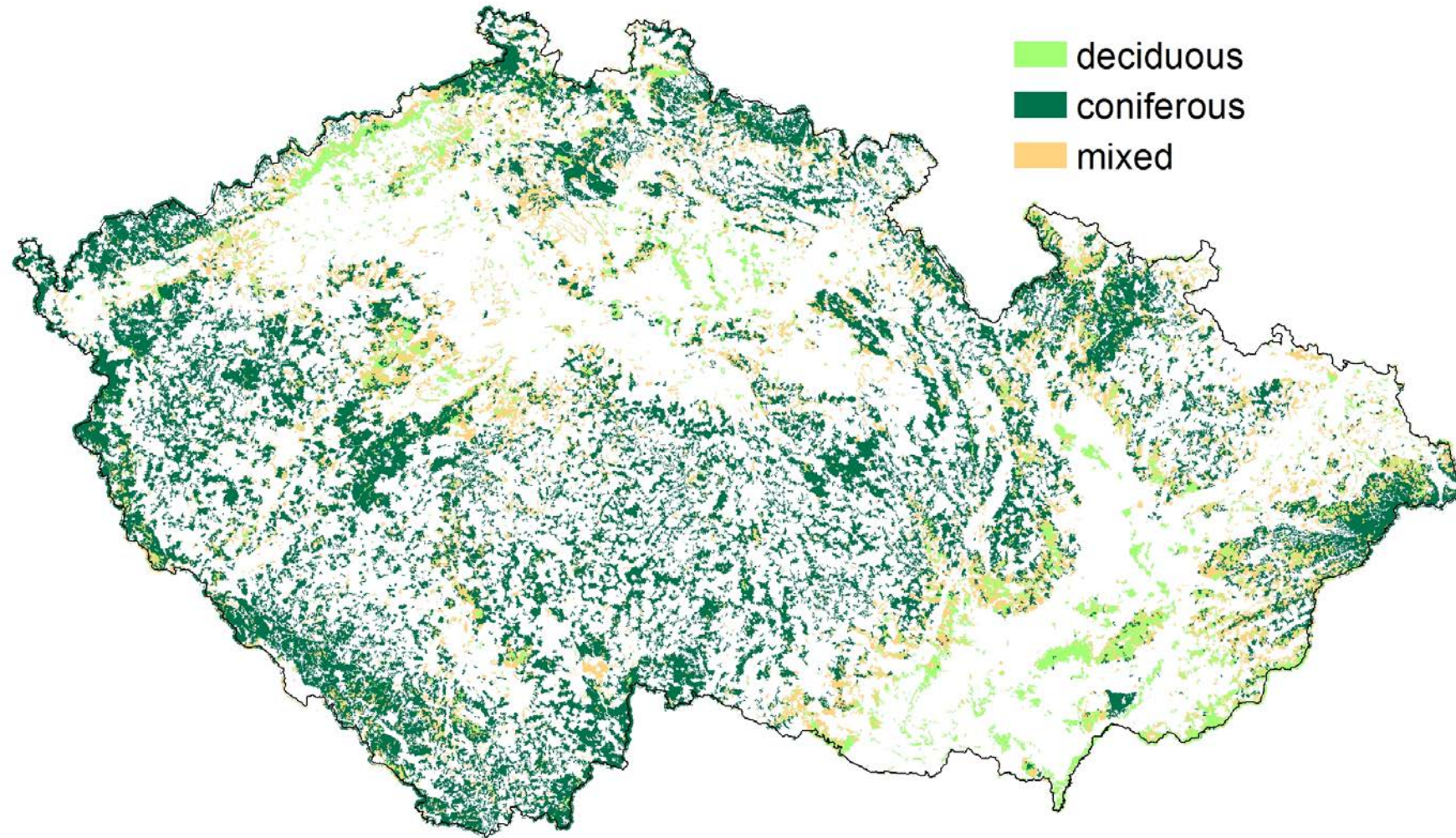


SOILCON  
Prague 18. 9. 2023

Vít Šrámek, Věra Fadrhonsová, Tomáš Čihák  
Kateřina Hellebrandova Neudertová, Radek Novotný et al.



# Forest and Forest soils cover 34% of the area



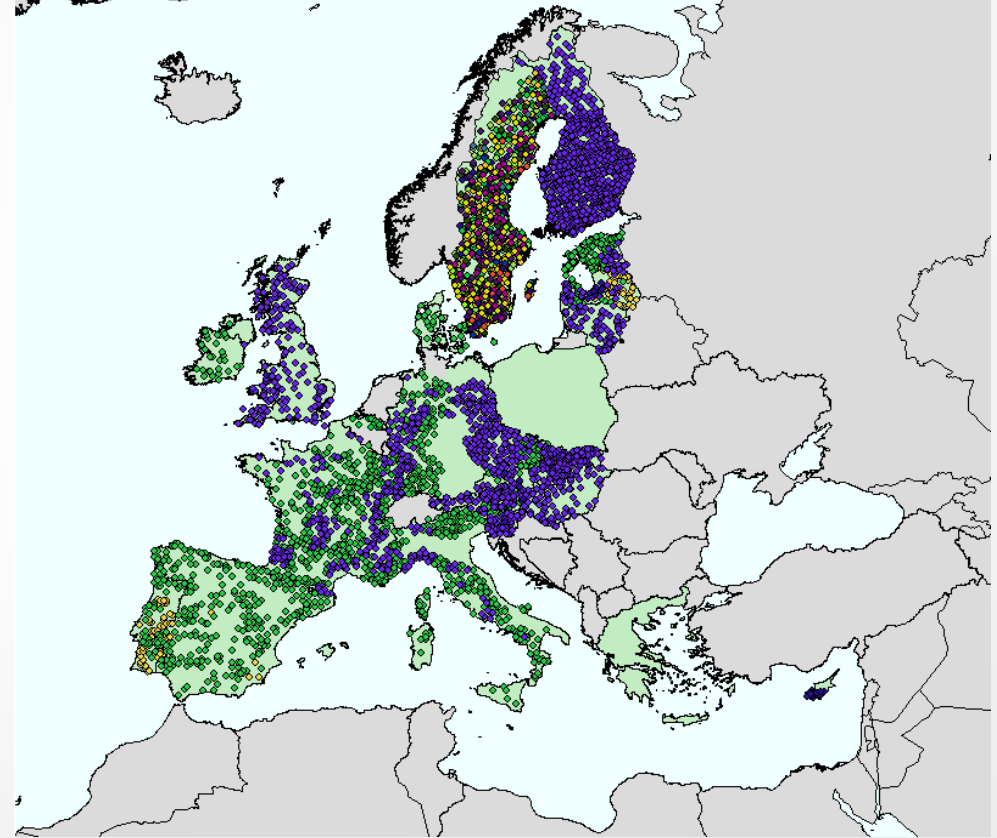
- Forest nutrition
- Landscape hydrology
- Carbon sequestration
- Biodiversity
- Acidification
- Heavy metal deposition
- Nutrient depletion
- Erosion





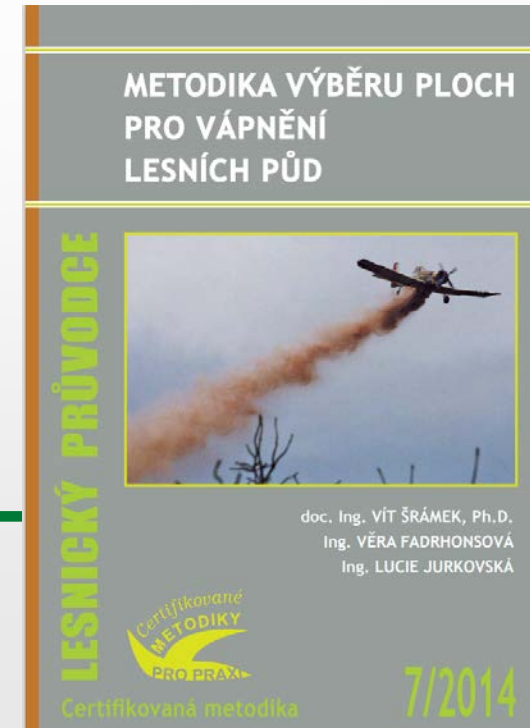
# ICP Forests

- 1<sup>st</sup> soil survey (1996)
- 2<sup>nd</sup> soil survey – BioSoil (2005 – 2008)
- 3<sup>rd</sup> soil survey – *planned 2025-2028*
- Intensive forest monitoring plots (every 5 years)



# Forest Nutrition evaluation and liming of acidified soils

- Foliage and soil nutrients analyses
- Methods/plans/proposals for forest liming/fertilizing
- Control of dolomite aerial application (amount, quality)
- Long-term control of forest liming (2y, 5y, 10y)





# Forest Soil surveys in the Czech Republic

## Forest Management Institute



- Site index mapping
- National Forest Inventory (I, II)

## Central Institute for Supervising and Testing in Agriculture



- Soil survey in polluted areas
- Soil survey in genetically valuable forests
- Evaluation of forest liming

## Forestry and Game management research Institute



Výzkumný ústav  
lesního hospodářství  
a myslivosti, v. v. i.

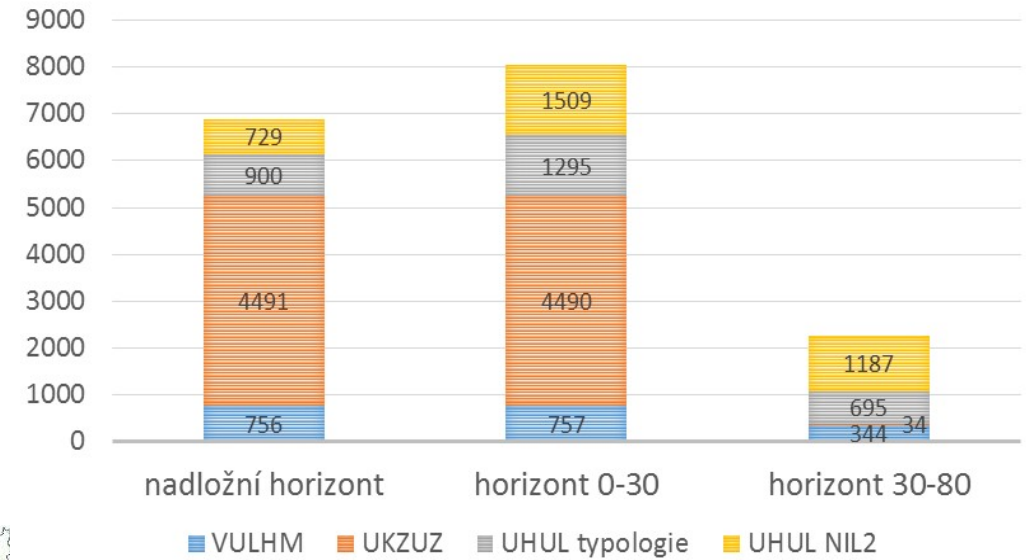
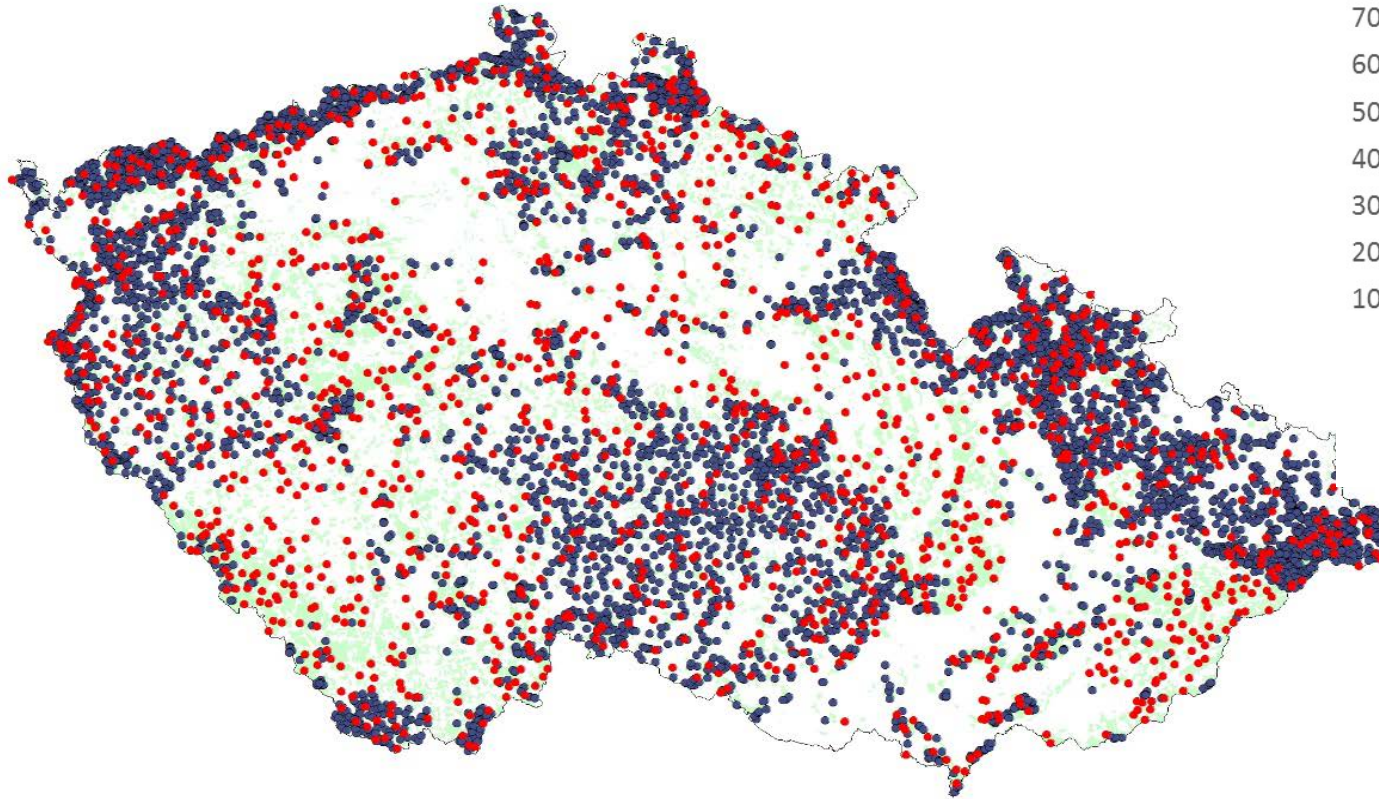
- ICP Forests monitoring programme
- Evaluation of forest liming
- Research projects
- Expert services for forest owners



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# Agregation of existing databases into three soil layers

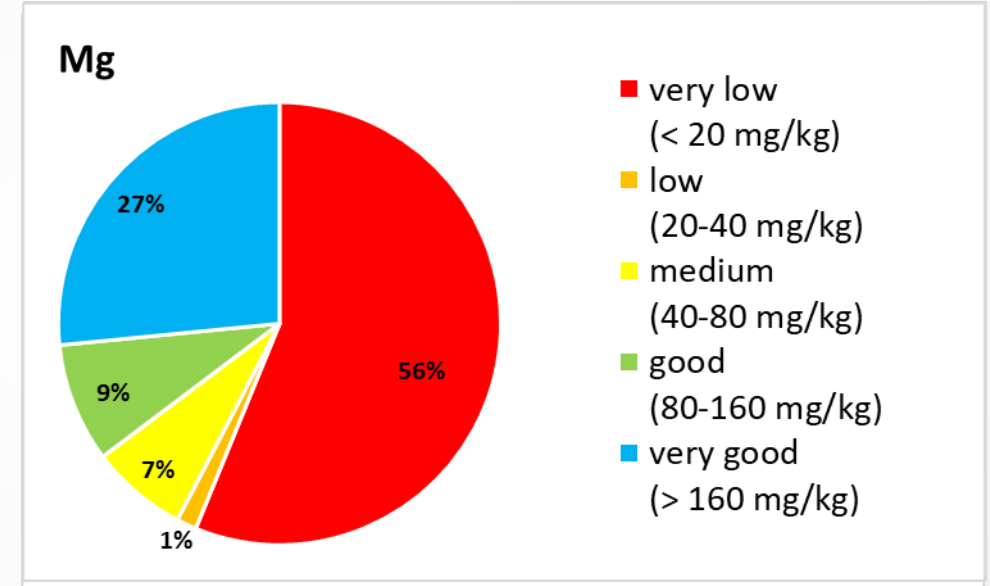
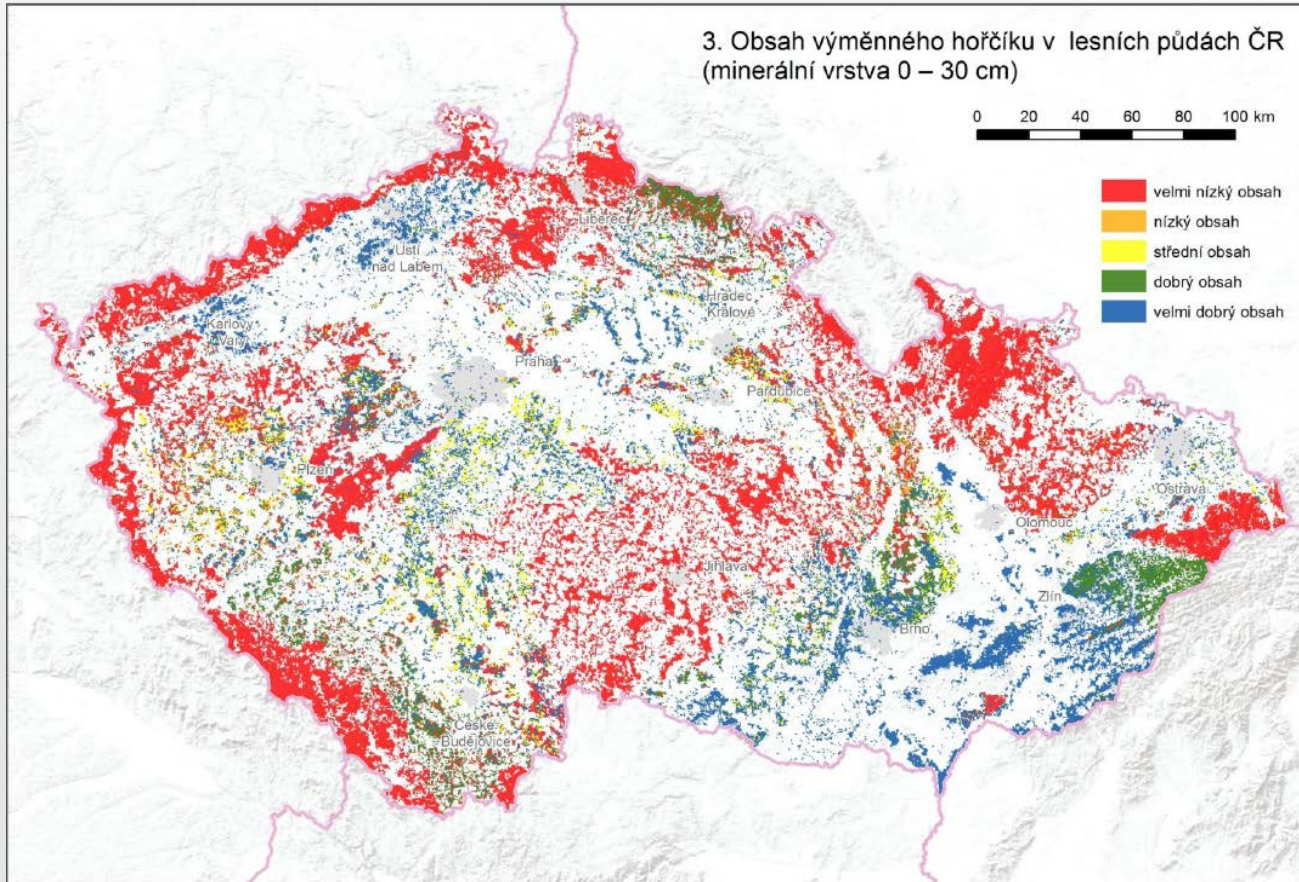


- FH 6.876 localities
- 0-30 cm 8.051 localities
- 30-80 cm 2.260 localities

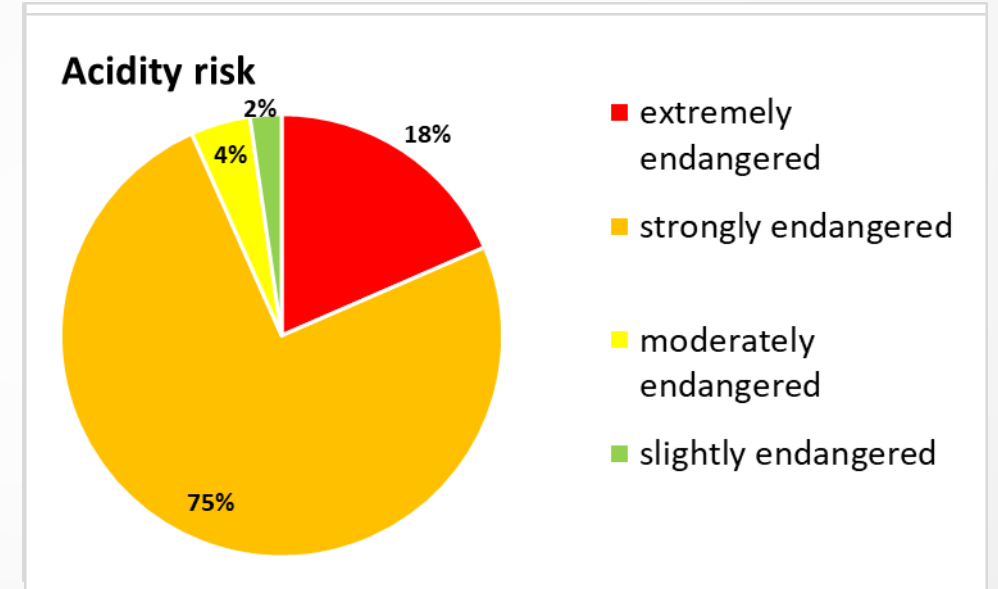
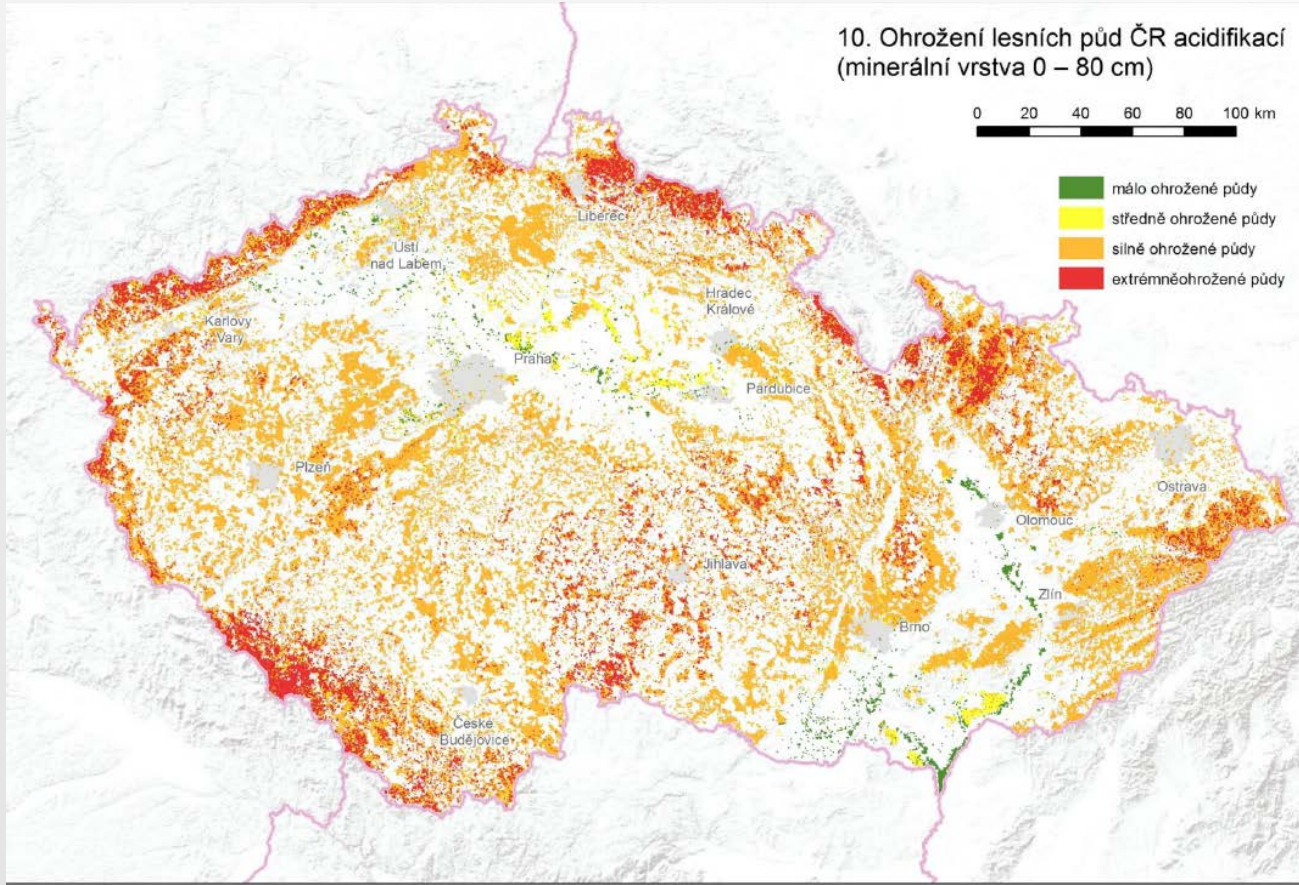




# Exchangeable Mg content in the upper mineral soil 0-30 cm

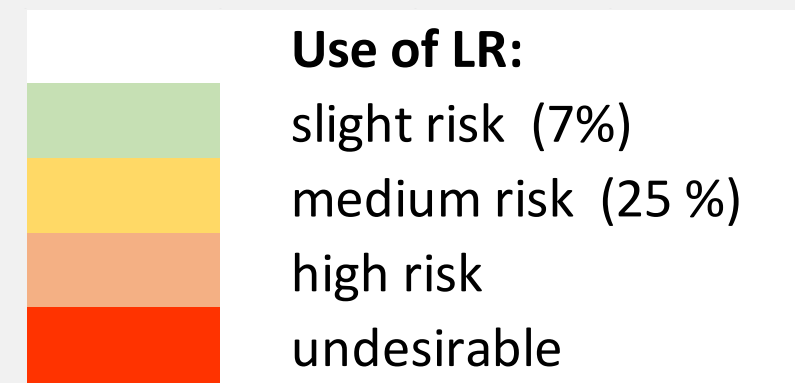
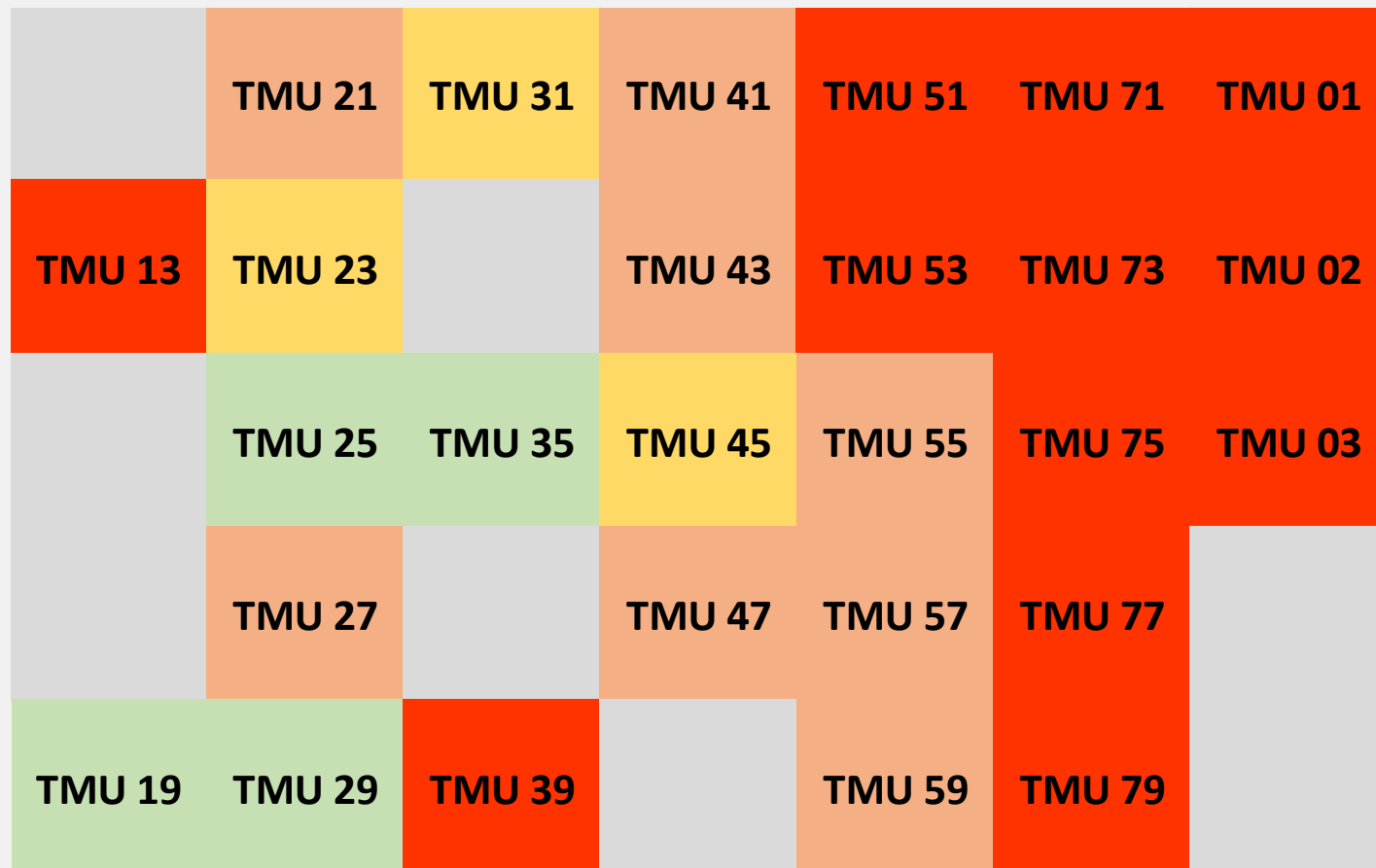


# Acidification and nutritional degradation risk for forests



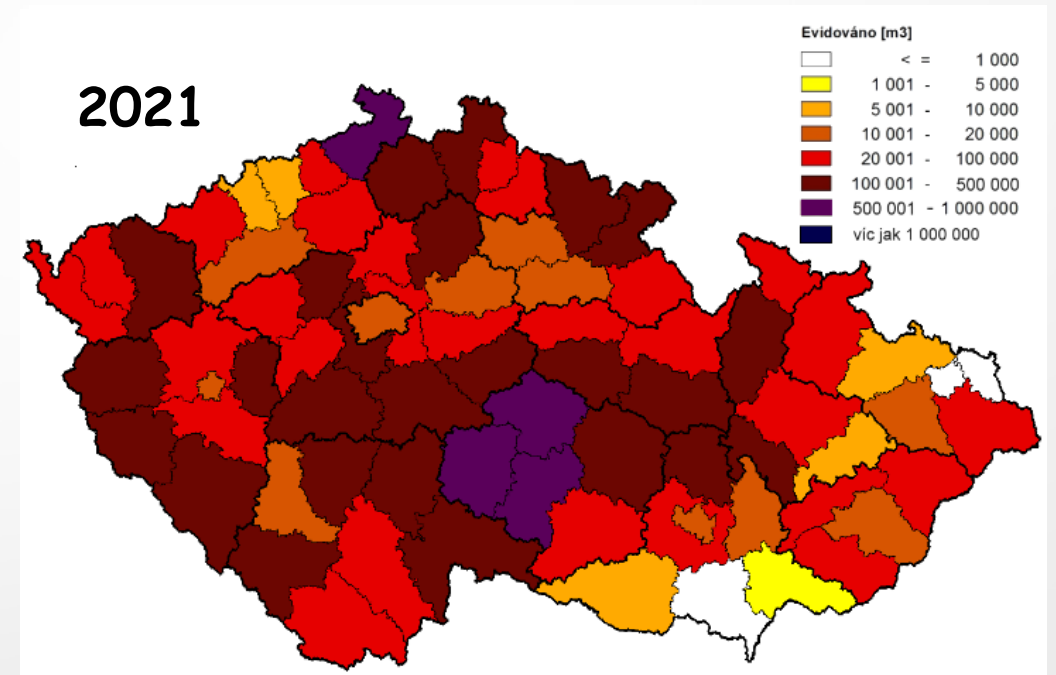
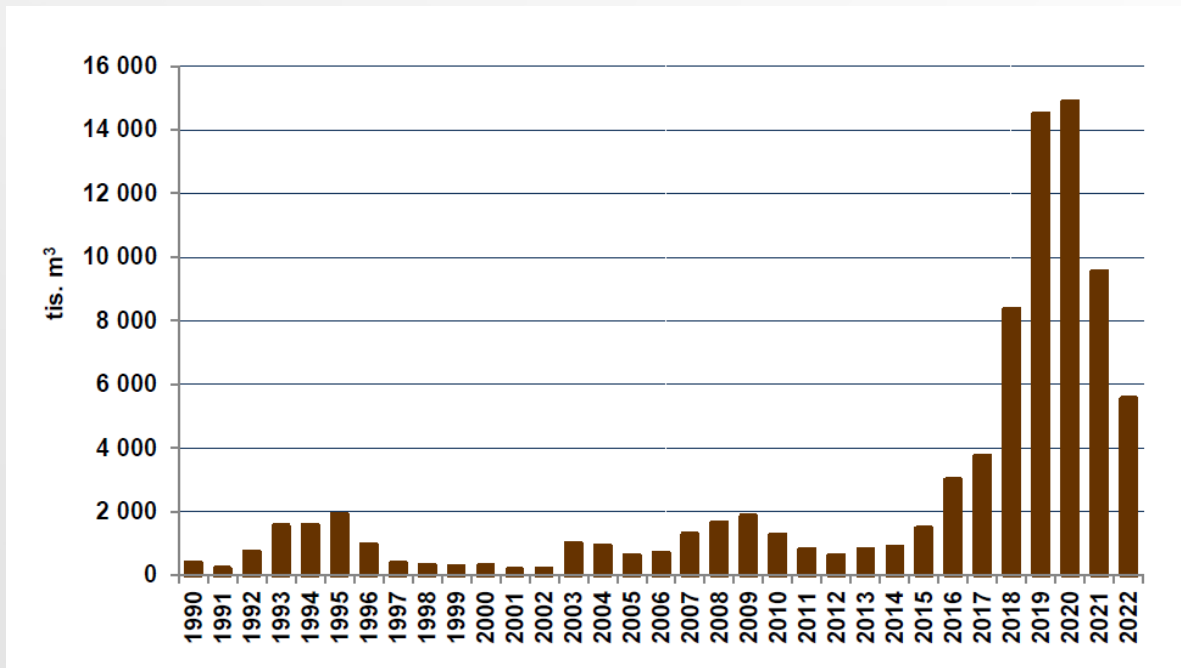


# Nutrient sustainability - Management of logging residues (LR)



# Bark beetle calamity in Czech forests

- Calamity since 2015 (2015-2017: 11.8 M m<sup>3</sup>)
- Extreme calamity since 2018 (2018-2020: 55.6 M m<sup>3</sup>)
- Rough estimate of the clearcuts amount: 150.000,-





# Risk of organic layer decomposition

- More light, higher temperature, enough of humidity  
→ increased decomposition of organic matter  
(humus layer)

## Consequences to:

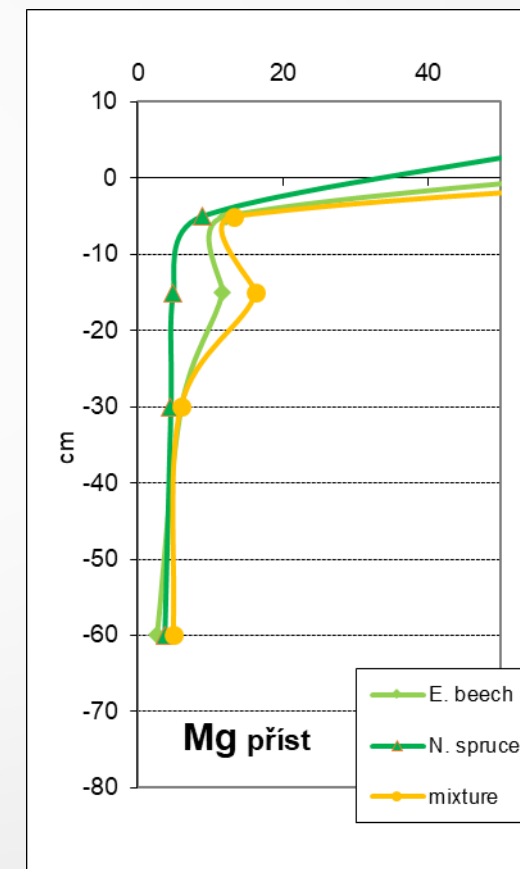
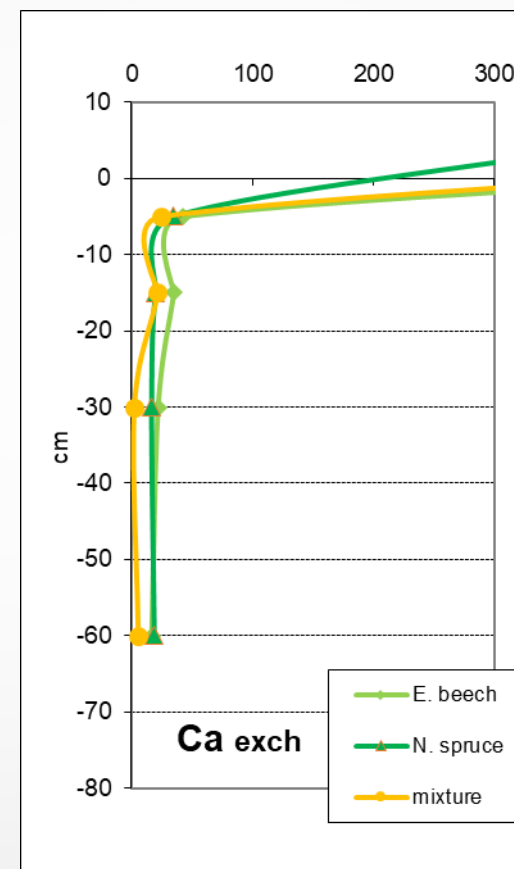
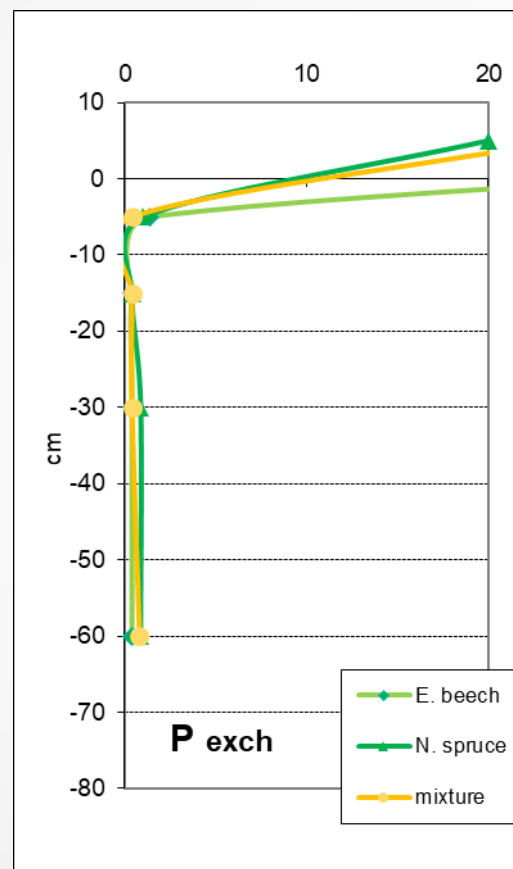
- Carbon stock (C sequestration)
- Nutrient stock (soil fertility)
- Heavy metal release

The risk is reduced by immediate reforestation



# Main stock of nutrients is often located in upper organic soil layer

In the Czech Republic acidic soils on old mother rock with low supply of nutrients – mainly base cations prevail. High atmospheric deposition of acid compounds played also important role during the last century. Exchangeable content of nutrient is often under the deficiency limit which is true mainly for phosphorus, calcium and magnesium.

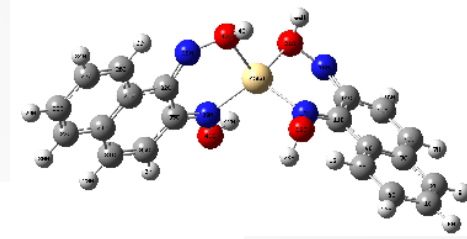


Set of plots Chribska (European beech, Norway spruce, mixed stand; Lausitzer Mts., 530 m a.s.l.)

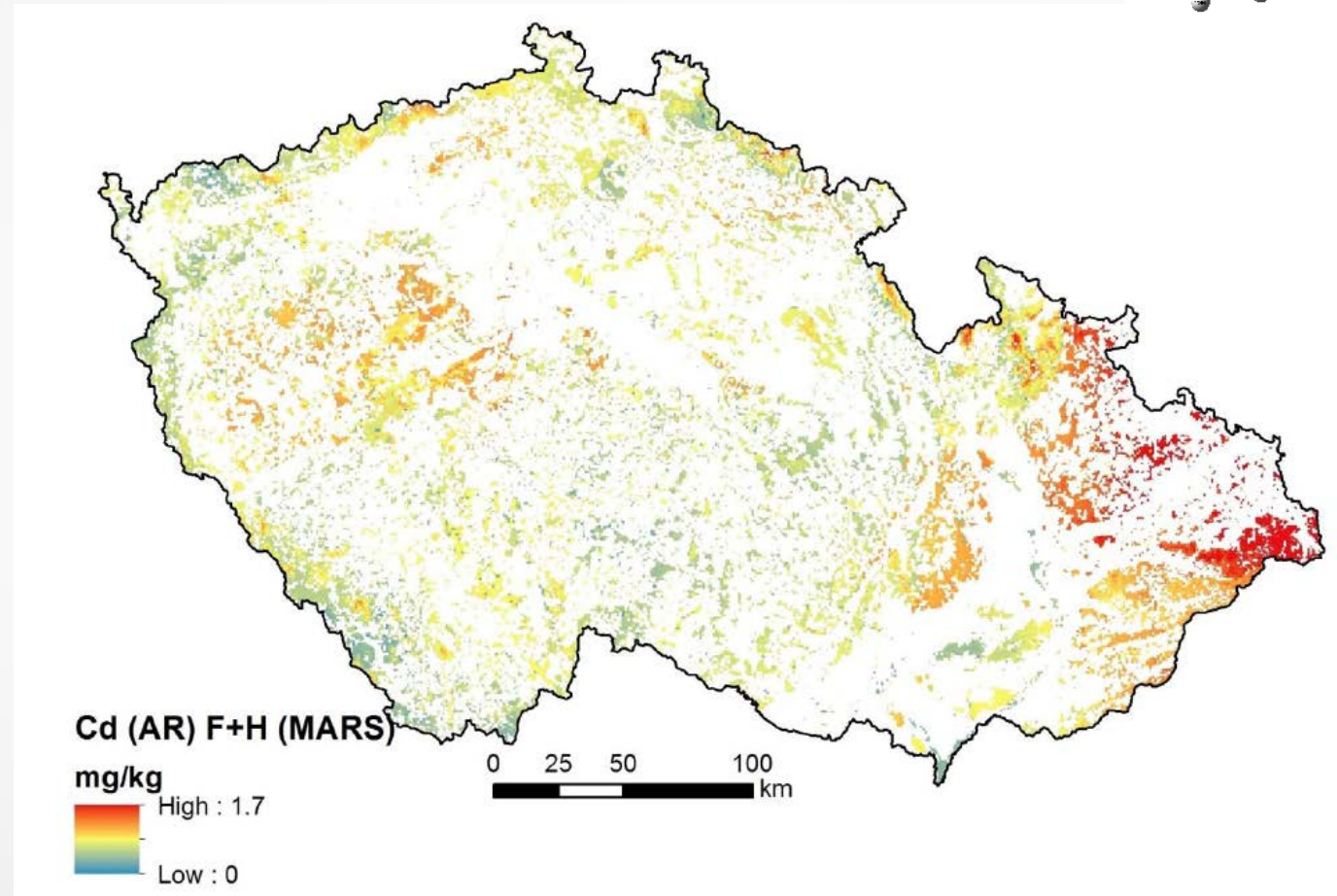




# Risk of heavy metals release



- Heavy metals are bound in complex stable structures in the soil organic matter
- They are fixed in higher concentration in organic layer than in mineral soil with exception of geogenous metals
- In some region the risk of heavy metal release can be significant
- Cd, As, Pb, (Hg)

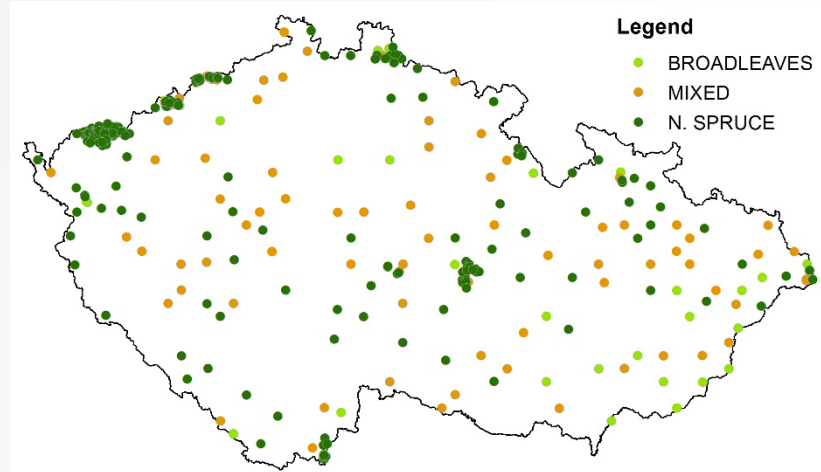


# Differences in humus layer / C stock under different tree species



N. Spruce stand

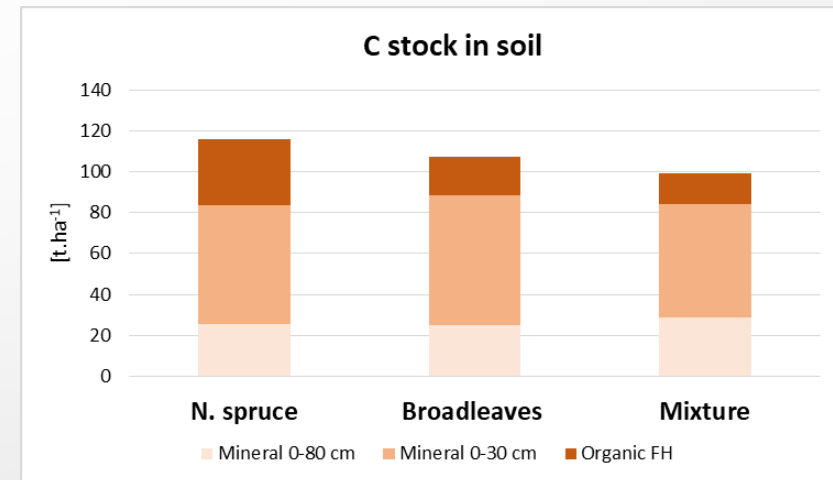
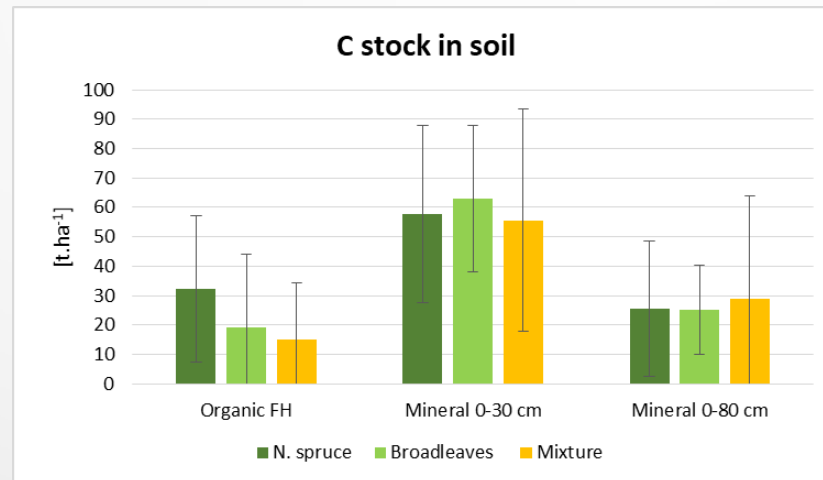
Broadleaved stand



**At risk: 30 t of C / ha**

**Comp. Broadleaves: 12 t of C / ha**

**Whole soil profile: 8 t of C / ha**





# Summary I

## Forrest soil surveys:

- ICP Forests
- Control of forest Nutrition
- Cooperation with other institutes (**FMI – NFI; CISTA**)



# Summary II

## National research projects:

- Potential toxicity of Aluminium in forest soils (2010-2013)
- Risk elements in Forest soils of the Czech republic (2011-2014)
- Nutrient balance in mixed forests COST-EUMIXFOR (2014-2017)
- Forest management and sustainable balance of nutrients in forest soils (2017-2020)

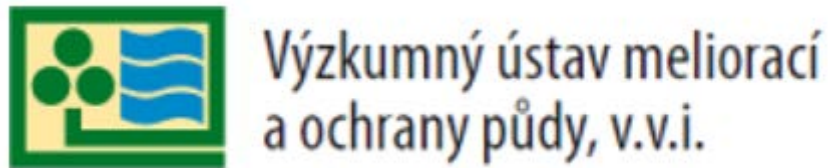


# Summary III

## National research projects:

- Spatial models of forest soil properties in the Czech Republic (2019-2021)
- Changes in forest soils on clearcuts (2022-2024)
- Forest management and carbon storage in forest soils (2023-2026)

# Many thanks to cooperating institutions



Ministry of the Environment  
of the Czech Republic



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# Thank you for your attention



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