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Monitoring microhabitats in the Swiss National Forest Inventory

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The Swiss NFI tasks

- Federal Act on Forests

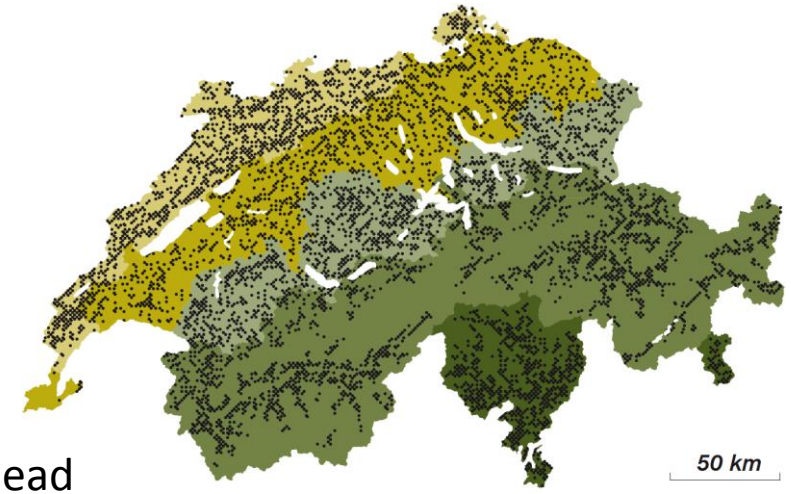
  Art. 33 The Confederation shall ensure that periodic surveys of the sites, functions and state of the forest are carried out.

- Pan European Criteria & Indicators for SFM

  > Forest resources and carbon cycle
  > Ecosystem health and vitality
  > Productive functions
  > Biological diversity
  > Protective functions
  > Socio-economic functions

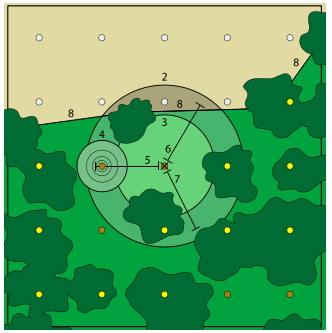



NFI methods



- Sample plot inventory

  > 6’500 plots
  > 2 circles of 200/500 m^2
  > ø 12 trees with DBH ≥ 12cm, living and dead

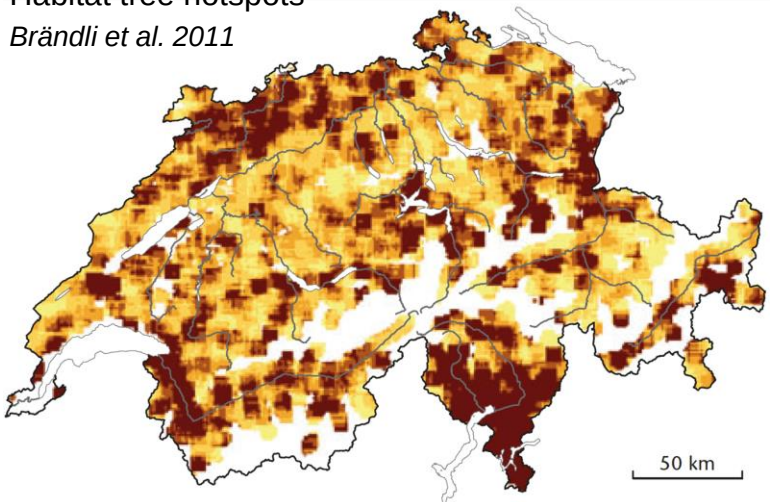


- «tree microhabitats» of the current 4th NFI

  Remarks and damages on <u>living trees</u> only

  - percentage of dead branches > 20%
  - dry top
  - fork
  - broken stem or bole
  - broken main branch
  - bark loss, exposed sapwood
  - crack, moulding
  - canker
  - bark necrosis
  - resin flow
  - fungus fruit-body, witches broom
  - woodpecker cavity

Habitat tree hotspots
Brändli et al. 2011



What else in the 5th NFI?

- Periodical evaluation of the NFI and information needs assessment

  Biodiversity (WSL): Bollmann, …, Lachat et al. 2013
  > more tree microhabitats

- Time budget for additional microhabitats

  3 to maximum 5 minutes per plot = 15 to 25 seconds per sample tree

- Microhabitat study 2016 by intern Amélie Quarteroni

  1) Which microhabitats: ecological relevancy?
     > Analysis of literature and data of 14 European marteloscopes

  2) Time consumption: all trees or subset?
     > Data analysis of 14 European marteloscopes comparable to Swiss forests

  3) Reproducibility: observer effect and visibility
     > Tests with NFI field teams on the Swiss Sihlwald marteloscope

Results (1 Which microhabitats and models)

- Literature

> Definitions vary in minimal size and size classes of microhabitats

> EFI catalogue covers all mentioned microhabitats in general
with in general good definitions > reference for the Swiss NFI

> The ecological values of the EFI model differ for some microhabitats
from literature (dead and broken branches)

> use more than one model to assess the ecological value of a tree
- EFI (score, scarcity, development)
- RB (only number all microhabitats)
- AQ (number of all microhabitats x number of habitat types)

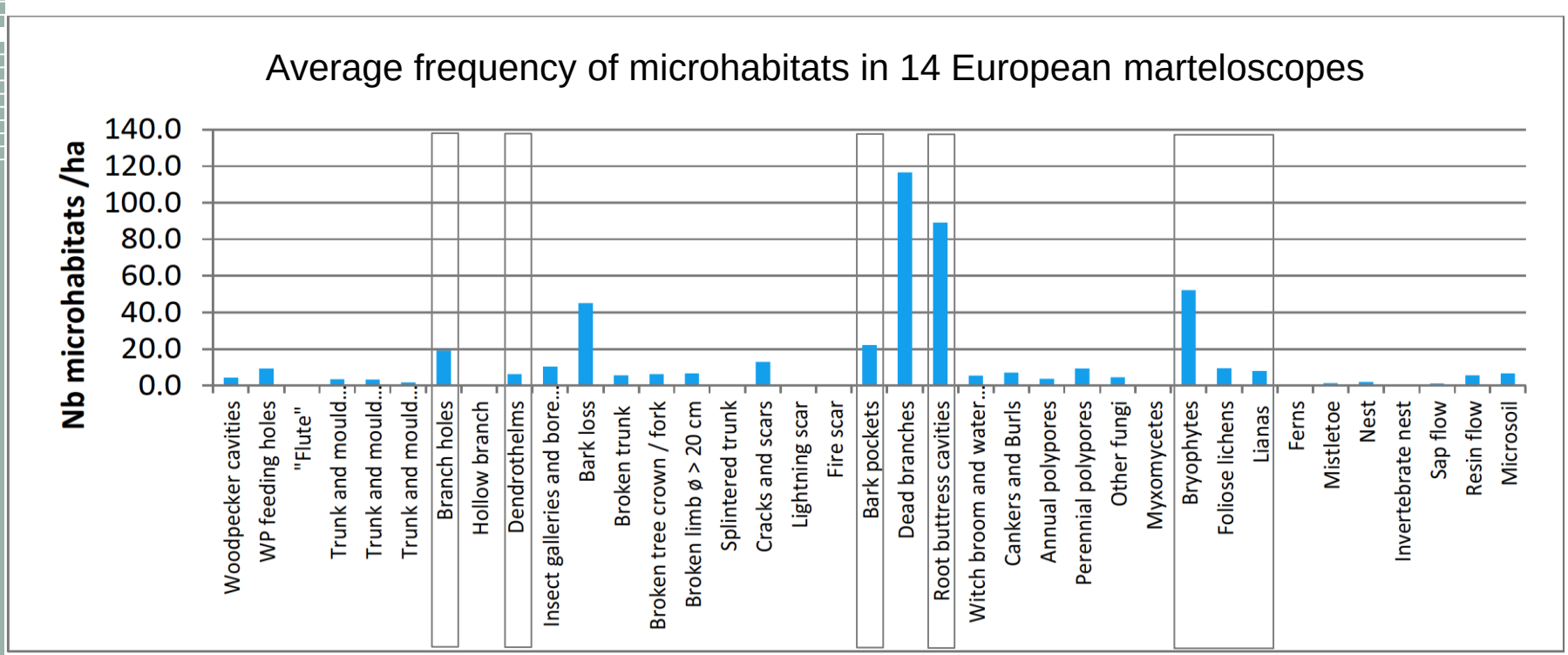
Results (1 Which microhabitats and models)

- Analysis of data from 14 marteloscopes in BE, CH, DE, FR, SLO

  > In the recent 4th NFI some important microhabitats are missing

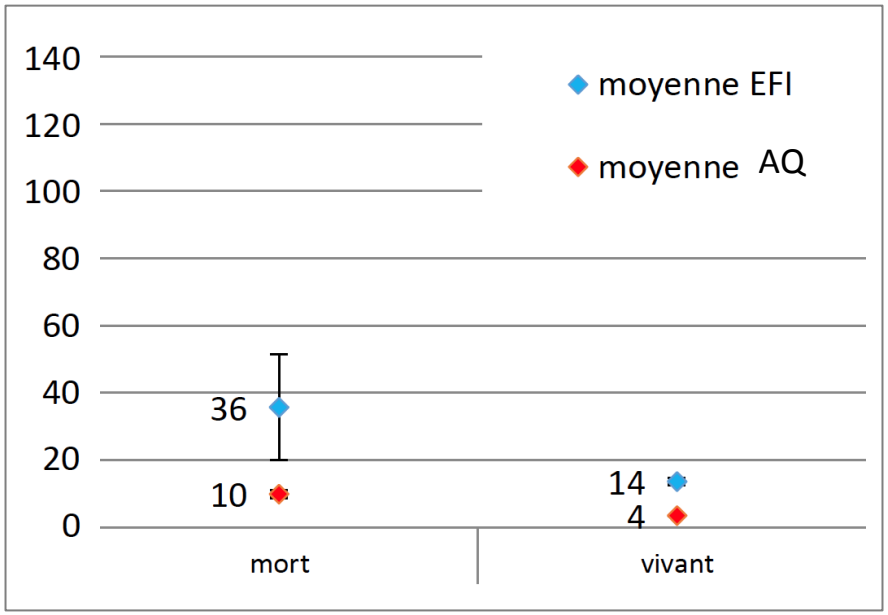
  - branch holes
  - dendrotelms
  - bark pockets
  - root buttress cavities
  - mosses
  - lichens
  - lianas

36% of the ecological value

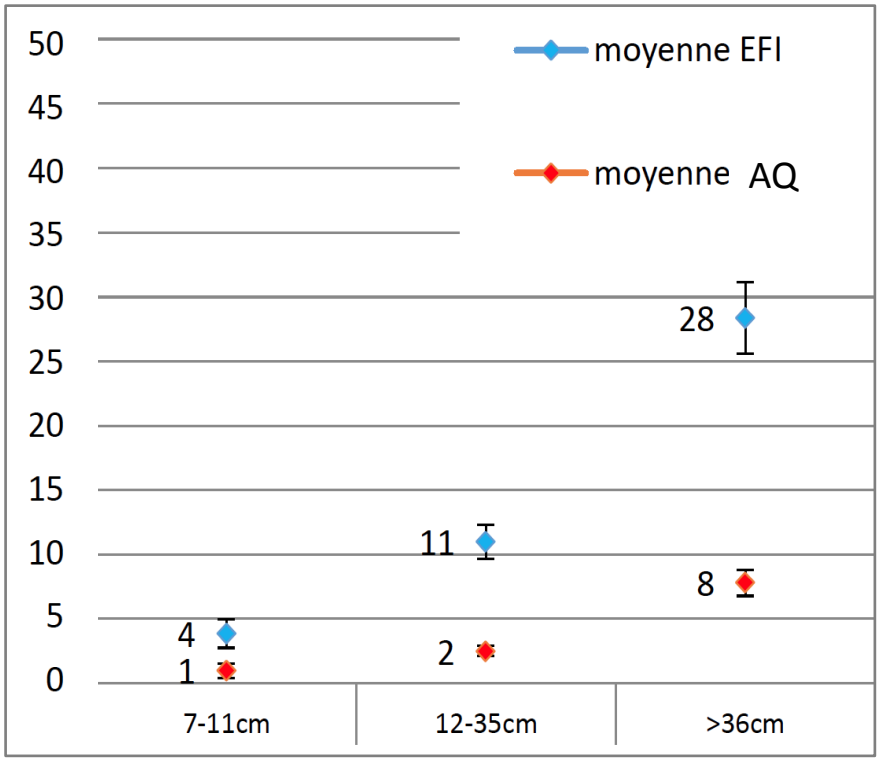


Results (2 Time consumption)

- Assessing microhabitats only on tick and living trees
  - > Depending on model, the ecological value of a tree with 12-35cm DBH is as much as 25-40% of a tree with ≥ 36cm DBH
  - > Depending on model, the ecological value of a dead tree is as much as 250-260% of a living tree



Average ecological values of trees by status and diameter classes in 14 European marteloscopes

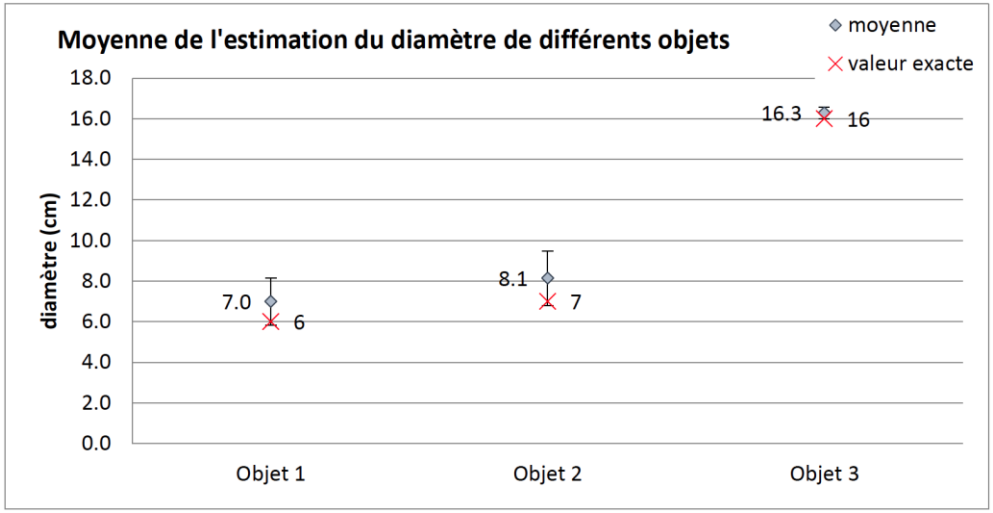


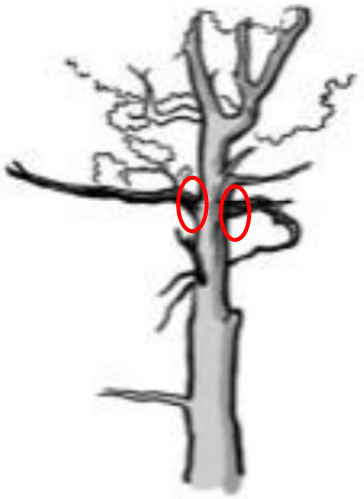
Results (3 Reproducibility)

- Test: Estimation of dimensions and visibility

  1) Our field teams are good in estimating diameters of e.g. branches in a distance of up to 30 meters: ± 1 cm

  2) But dead and broken branches in the crown are often not visible during vegetation period when NFI teams are working





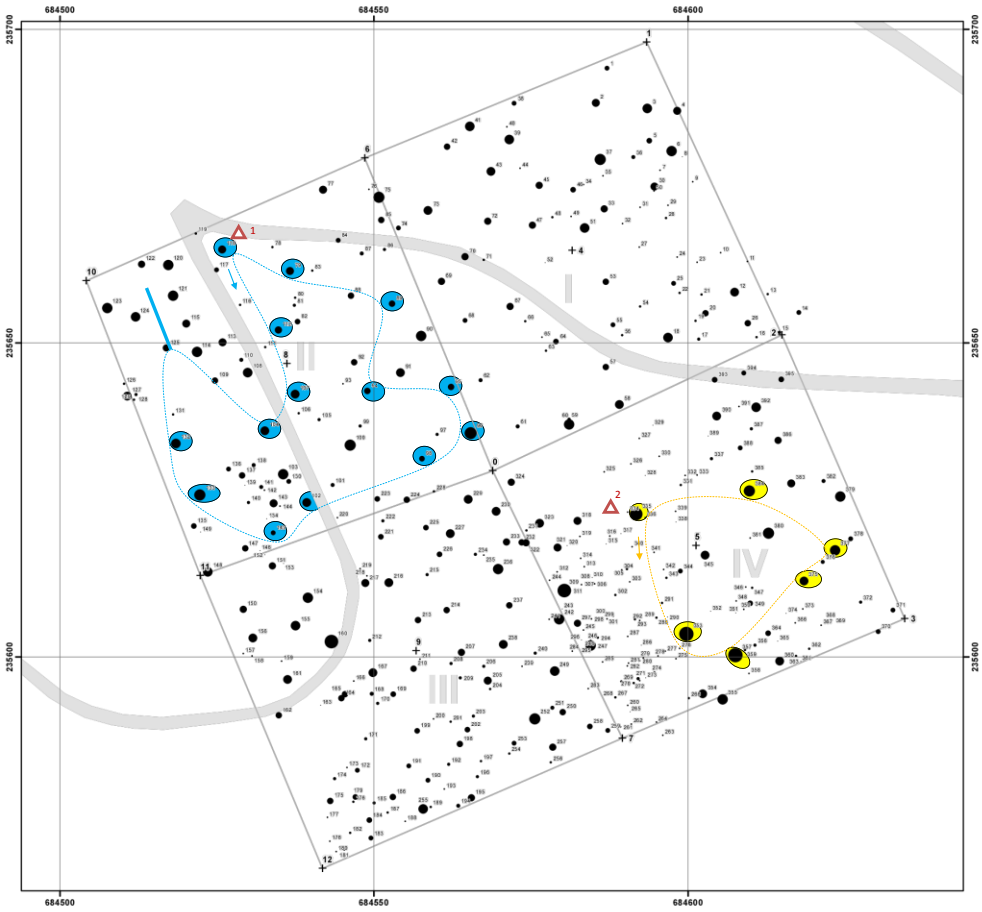
Results (3 Reproducibility)

- Test: Data quality, time and tools

1) In general TreMs underestimated, unsatisfactory matches, high variance
   > much more time than 1 hour is needed for instruction (definitions)

2) No better results when having double as much time (5+5 minutes/tree)

3) No better results using binoculars



Conclusions

- A multi task inventory like a national forest inventory (NFI) will never have the resources to survey all kinds of microhabitats

- We need European guidelines for periodic sample inventories
  > practicable agreement of specialists
  > set of reproducible core microhabitats
  > budget: less than 1 minute per tree (Swiss NFI 45 seconds)

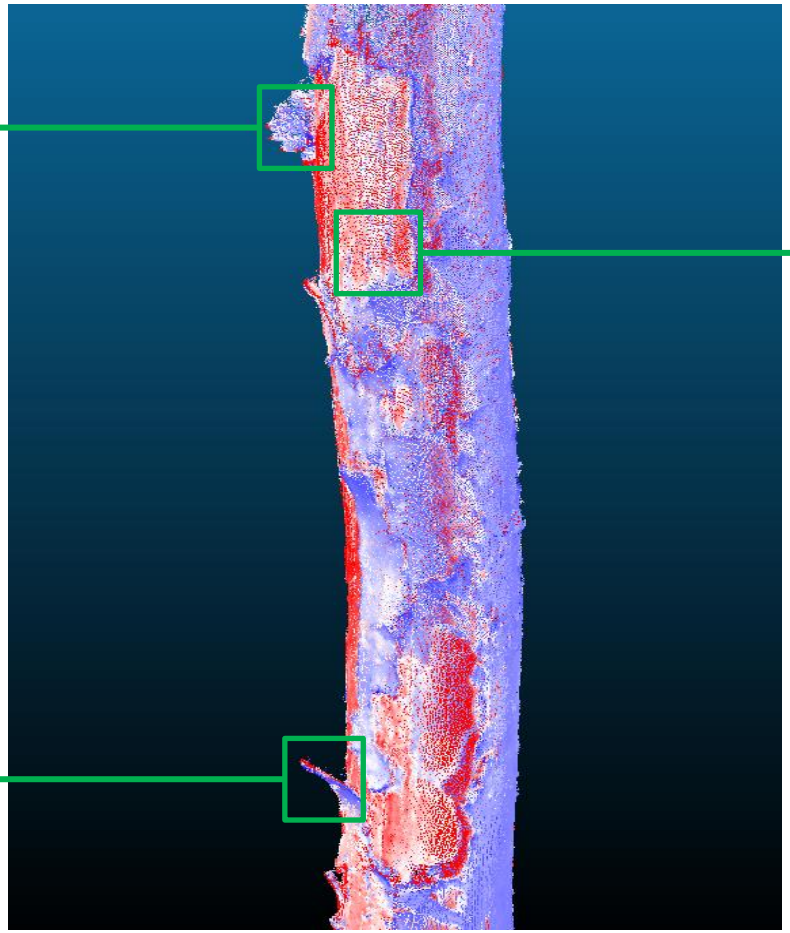
- 5th Swiss NFI (2018-27)
  > some new microhabitats as mentioned
  > all cavities, holes and cracks with dimension and location
  > dead and broken branches not in detail (time, visibility)
  > no root buttress cavities (relevant for management?)
  > all diameters ≥ 12 cm DBH, living and dead trees

The vision – terrestrial laser scanning TLS

Pilot study TLS stem structure 2016 – 2019

- An efficient method to survey stem quality and microhabitats?

fungus



bark loss

bark pocket

moss

We like microhabitats – thanks for listening