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# PRÍRODE BLÍZKE MANAŽMENTOVÉ PRÍSTUPY A MODERNÉ TECHNOLÓGIE PRE PODPORU BIODIVERZITY

SILVATECH4TREES

0410-2SC-BIO-PC2-002

# Marteloscopes in Switzerland

29.04.2026 - Vysoké Tatry

Prof. Dr. Christian Rosset, Bern University of Applied Sciences - School of Agricultural, Forest and Food Sciences (BFH-HAFL)

> christian.rosset@bfh.ch

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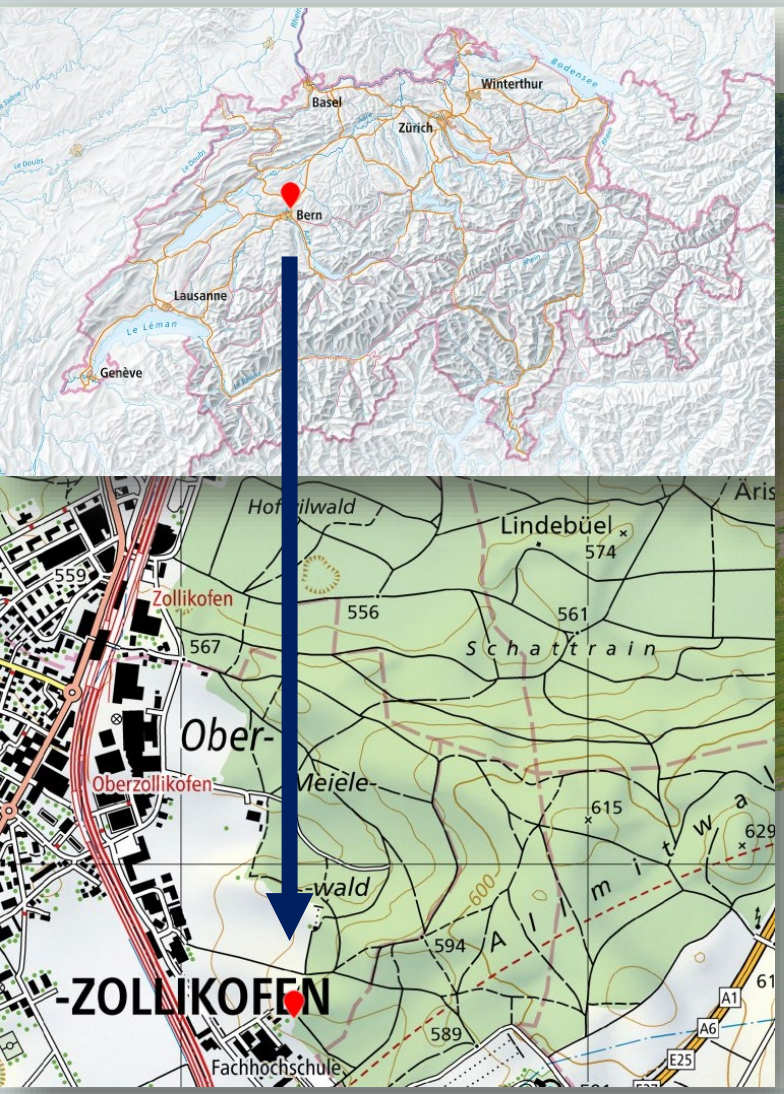


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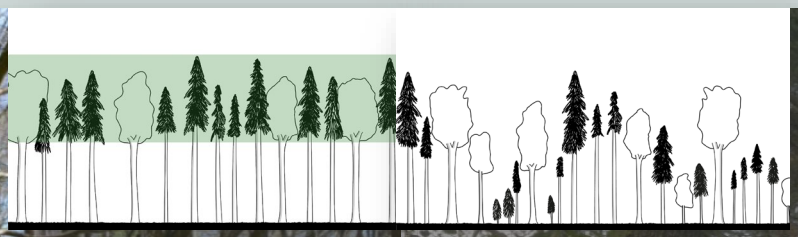
**Even-aged**
**… almost only beech**



**Uneven-aged**
**15+ tree species**

**Much can be done with close-to-nature silviculture, but at the rate of tree growth …**

**Similar site conditions**

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## Even-aged
… almost only beech

## Uneven-aged
15+ tree species

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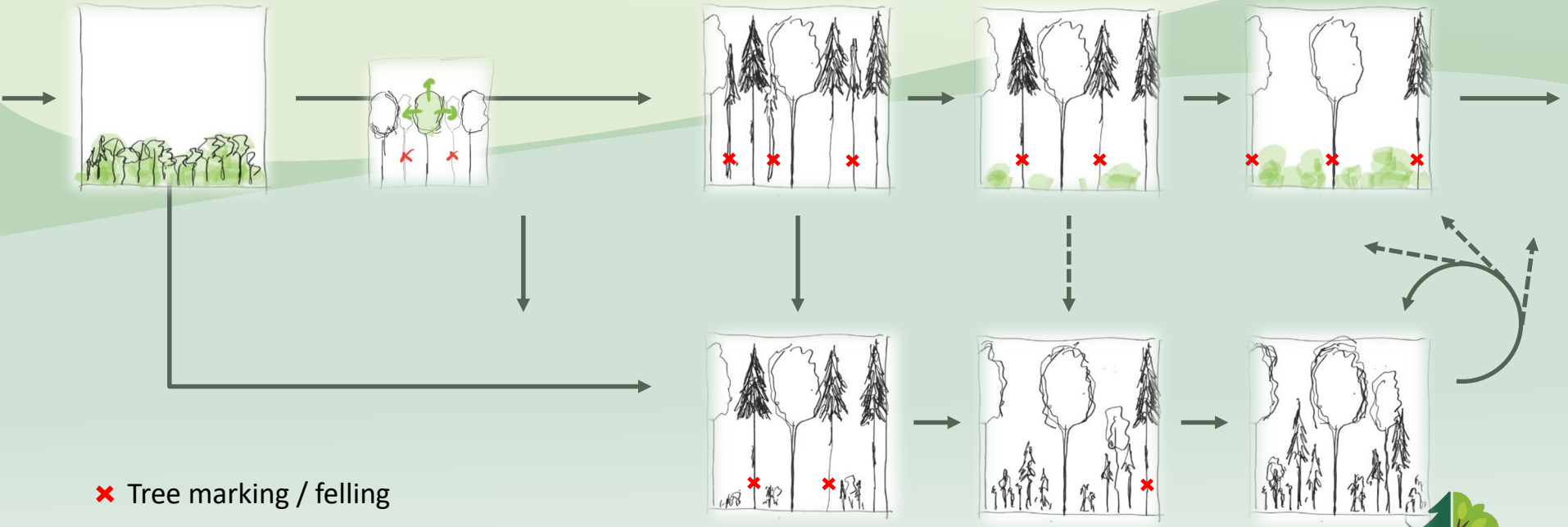
Switzerland: close-to-nature silviculture mandatory, no clear-cut, no chemicals

# Close-to-nature sylviculture > influencing natural processes, step by step with clear targets ...

Tending and thinning

... regeneration cuts



✖ Tree marking / felling

Transformation to uneven-aged ....

... uneven-aged in demographic equilibrium

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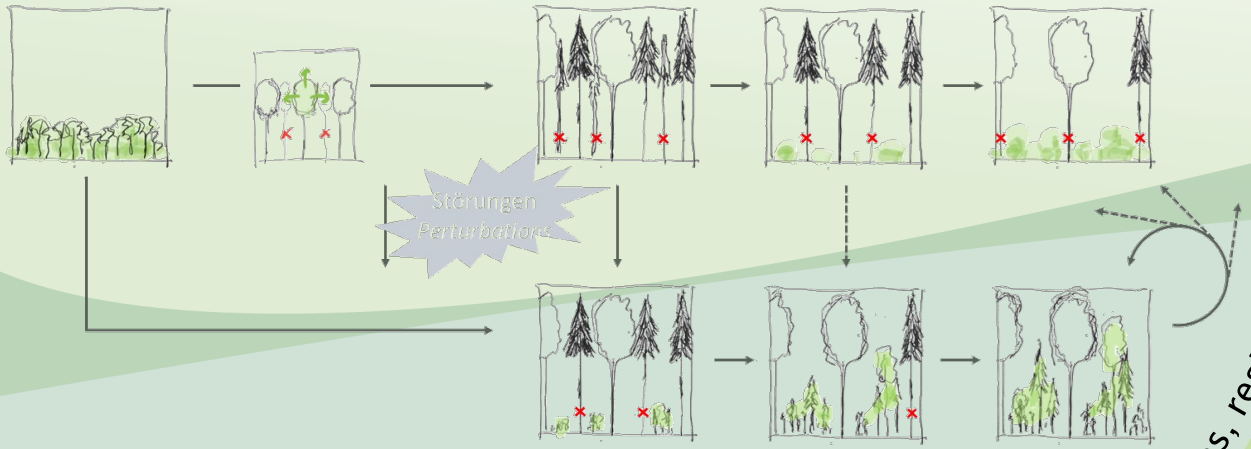
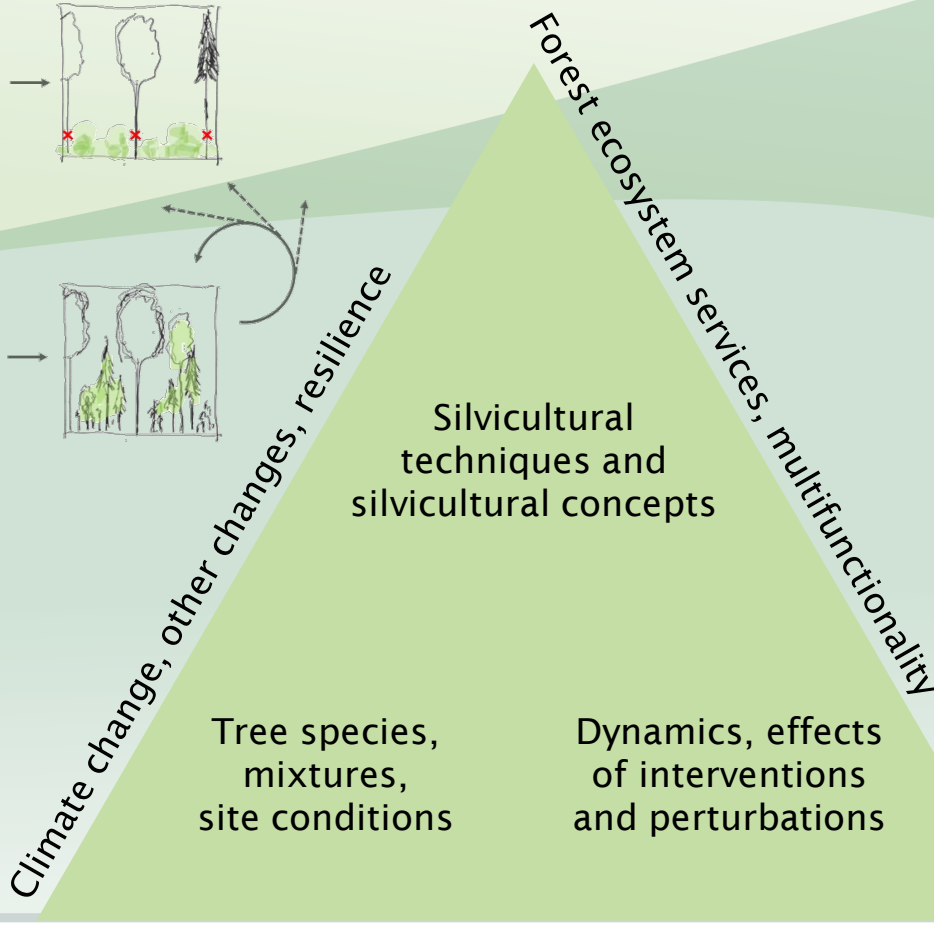
# Close-to-nature sylviculture > influencing natural processes, step by step with clear targets, based on facts and evidences …



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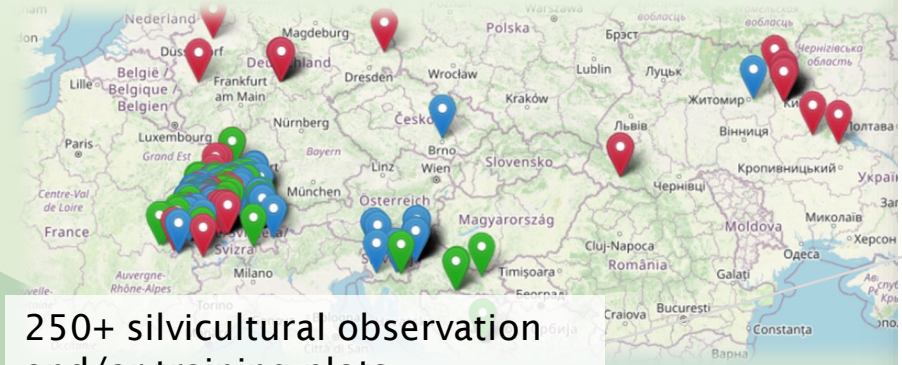
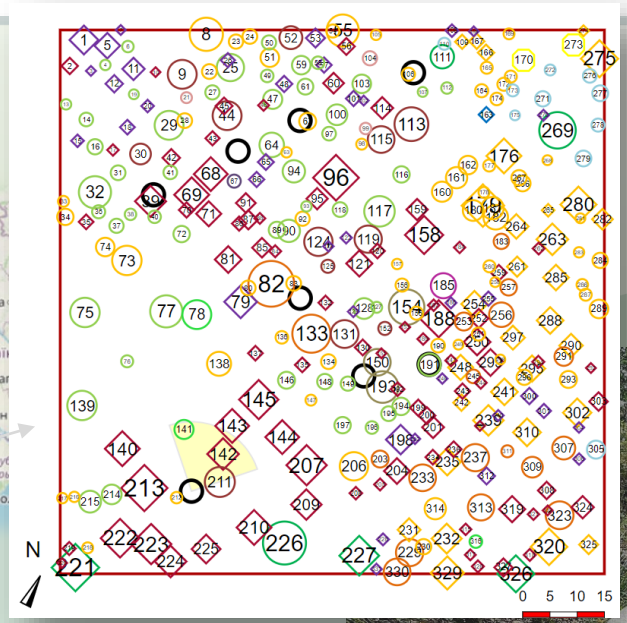
## martelage.sylvotheque.ch




250+ silvicultural observation and/or training plots




Interactive tree map on internet and on smartphones for tree marking exercises

Photosphere (360° Panorama) > time travel

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Sylvotheque
Martelage

Search

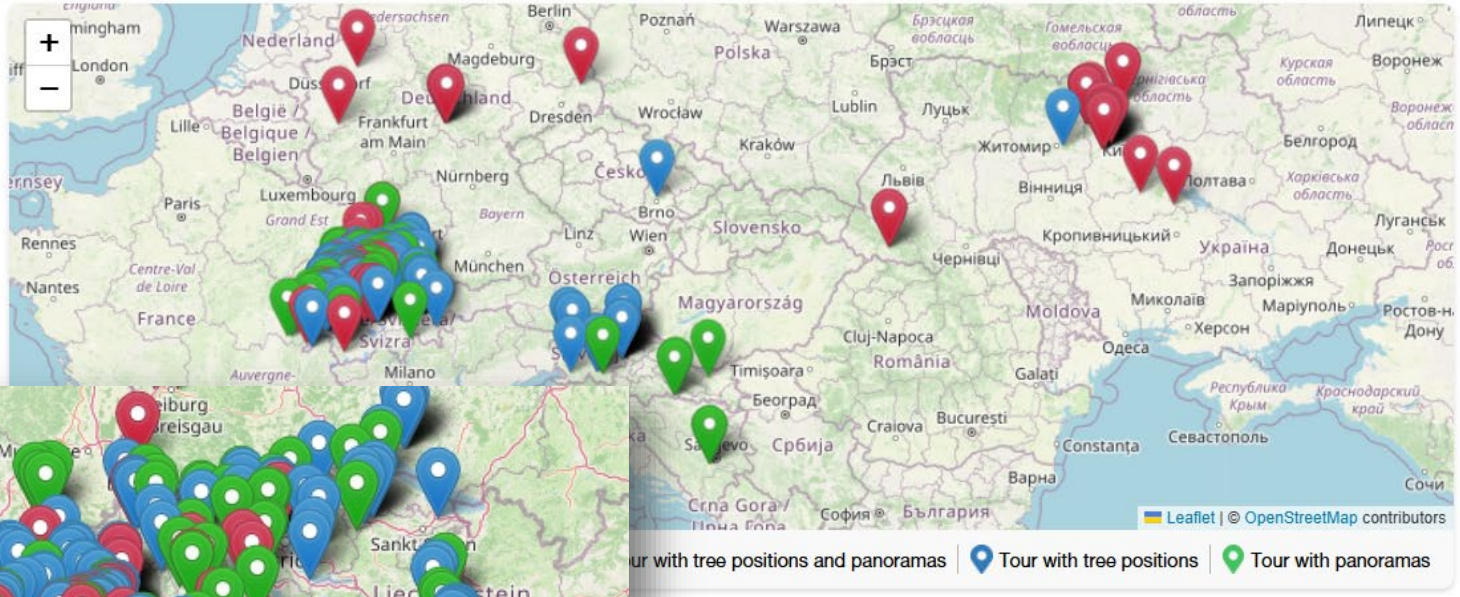
Home

Thematic filter

- Silviculture
- Main tree species
- Main focuses
- Diameter Class

Content types

- Tours
- Topic
- Guided visit




**> martelage.sylvotheque.ch**
**Easy access to a large network of marteloscopes from different organisations**

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# Possibility to practise in many different situations …

# Main motivation behind martelage.sylvotheque.ch (MSC)

- to document the diversity of forests and to illustrate the variety of close-to-nature silviculture practices
- to strengthen the understanding of forest ecosystems, their dynamics and how to influence these dynamics through concrete cases
- to facilitate tree marking exercises in a large number of different situations and to promote sharing between forest professionals
- to characterize and quantify silvicultural practices, monitor their effectiveness, compare and optimise them, formalise and document silvicultural know-how

Marteloscopes represent the key ingredient; they can be seen as pieces of a puzzle that provide an ever-improving overall picture of close-to-nature silviculture

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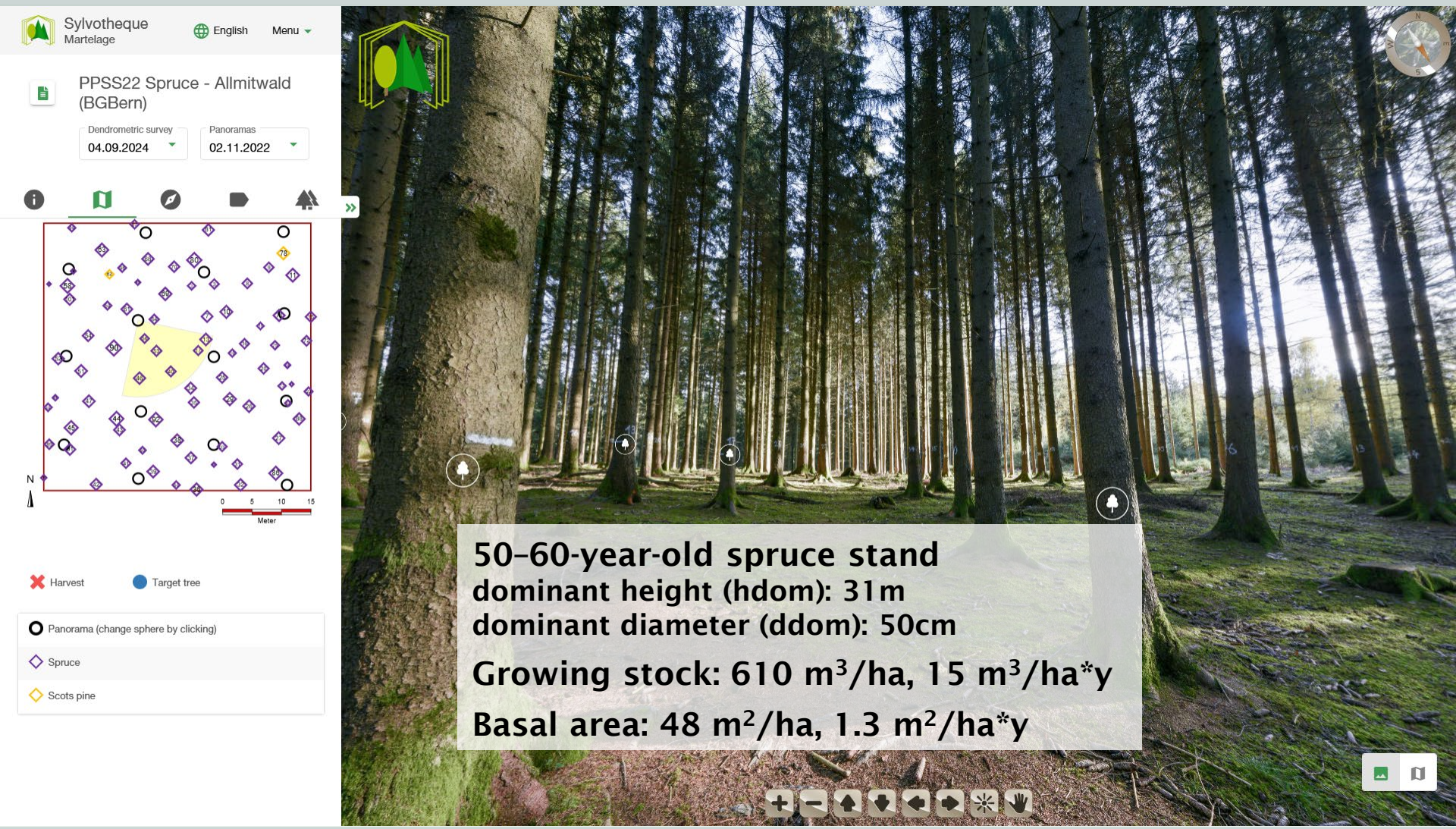
Sylvotheque
Martelage
English
Menu
PPSS22 Spruce - Allmitwald (BGBern)
Dendrometric survey
04.09.2024
Panoramas
02.11.2022
N
0 5 10 15
Meter
Harvest
Target tree
Panorama (change sphere by clicking)
Spruce
Scots pine
50–60-year-old spruce stand
dominant height (hdom): 31m
dominant diameter (ddom): 50cm
Growing stock? Increment?
Basal area? Increment?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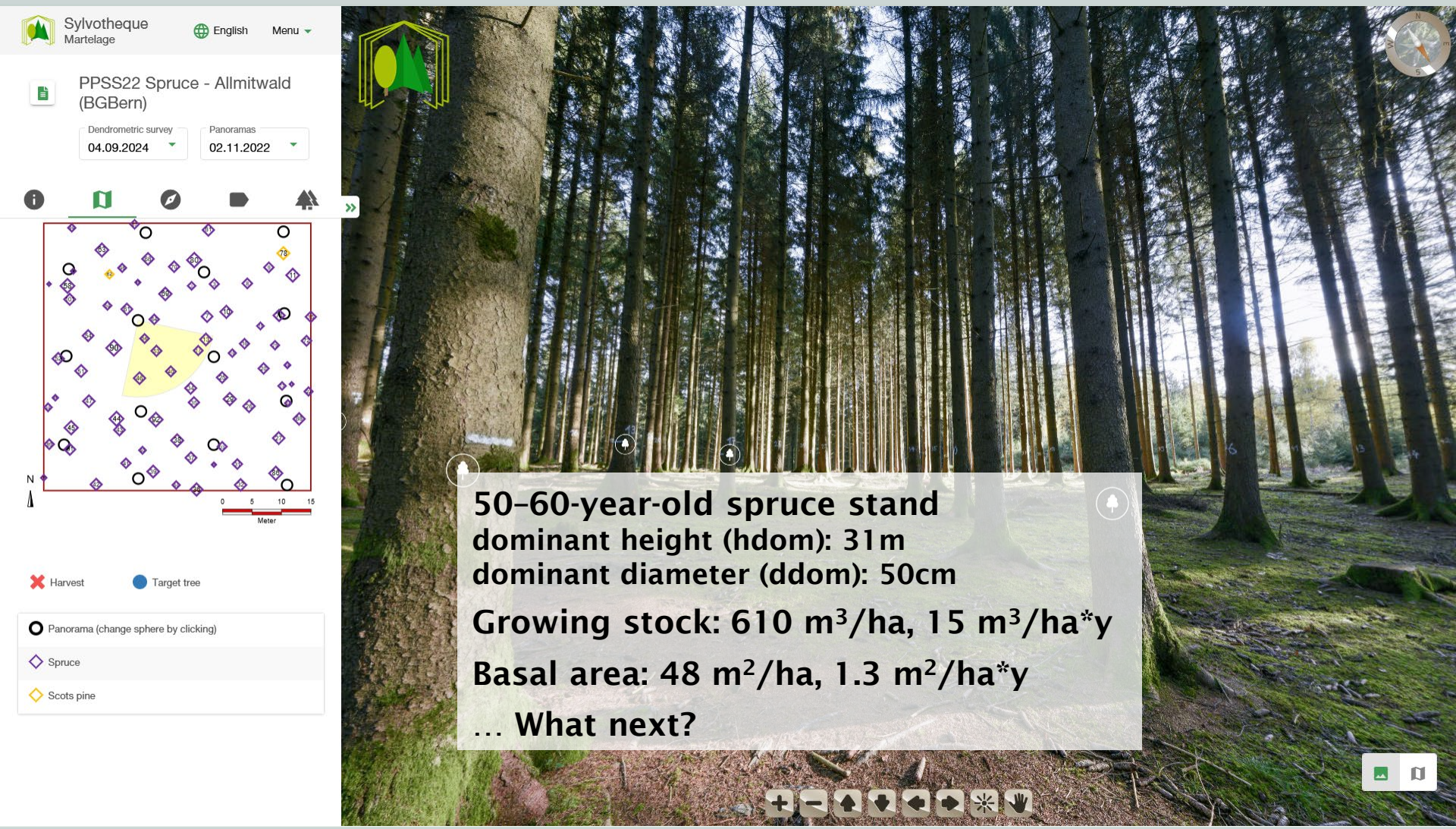
Spruce
Scots pine
50–60-year-old spruce stand
dominant height (hdom): 31m
dominant diameter (ddom): 50cm
Growing stock: 610 m³/ha, 15 m³/ha*y
Basal area: 48 m²/ha, 1.3 m²/ha*y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Growing stock: 610 m³/ha, 15 m³/ha*y
Basal area: 48 m²/ha, 1.3 m²/ha*y
… What next?

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## MSC Mobile

Android

iOS

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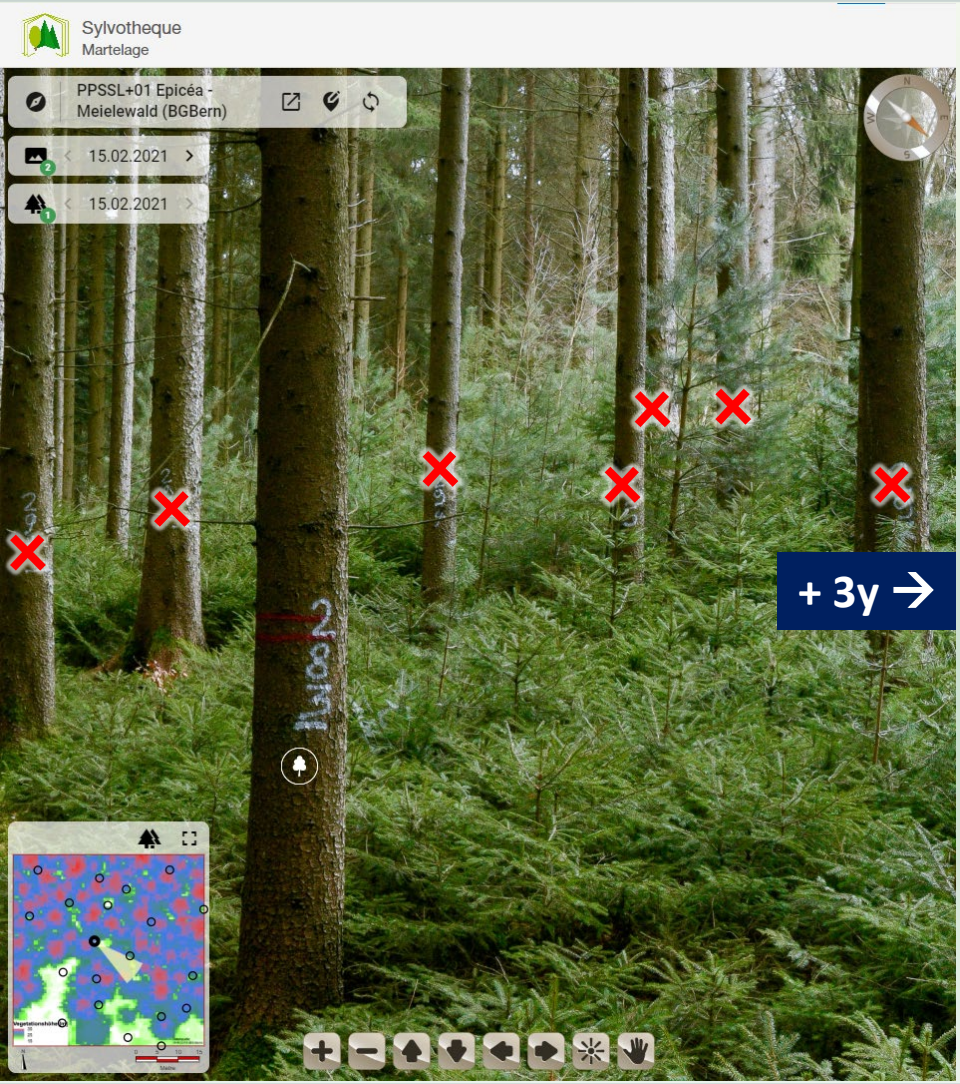


?

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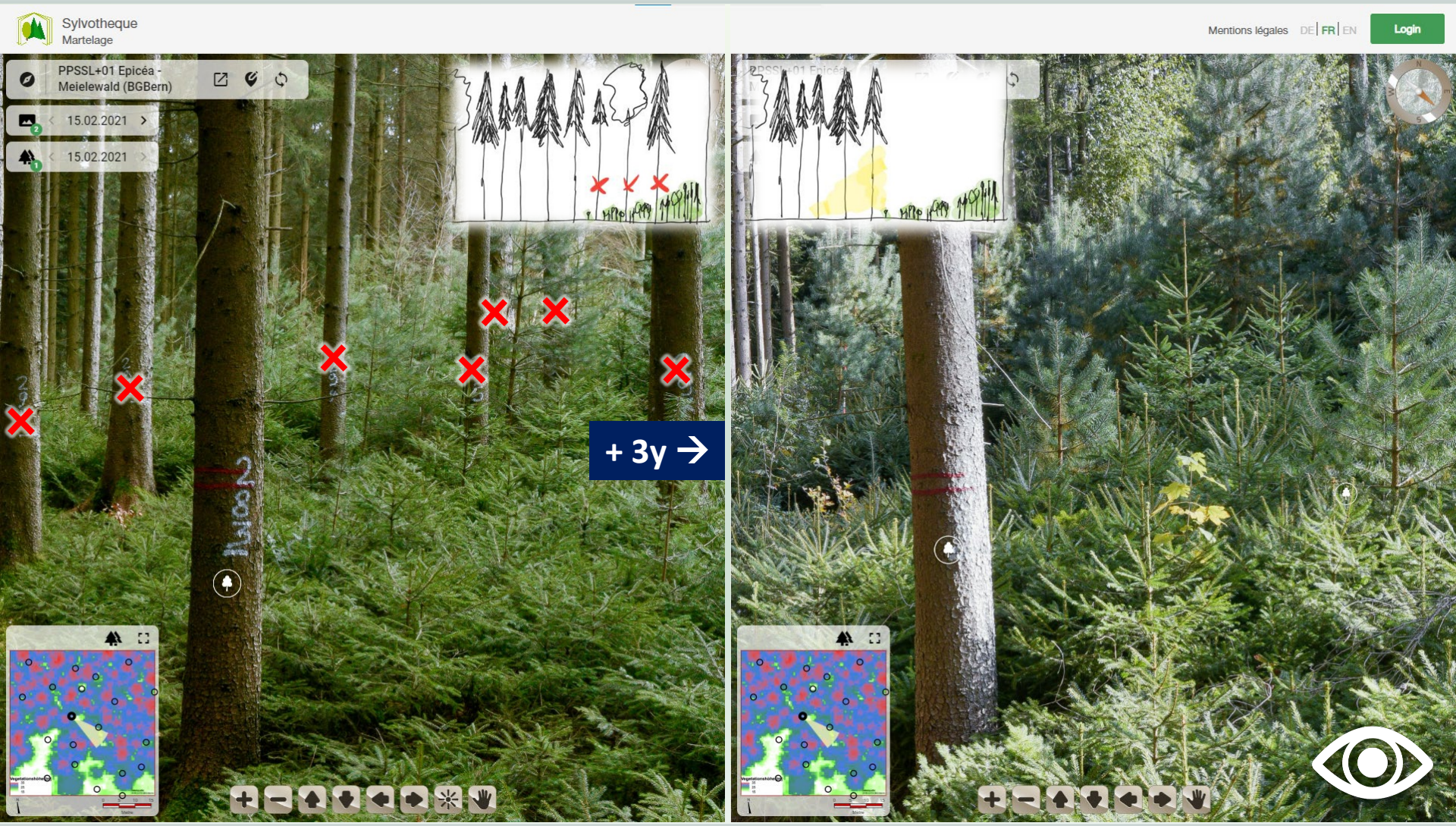
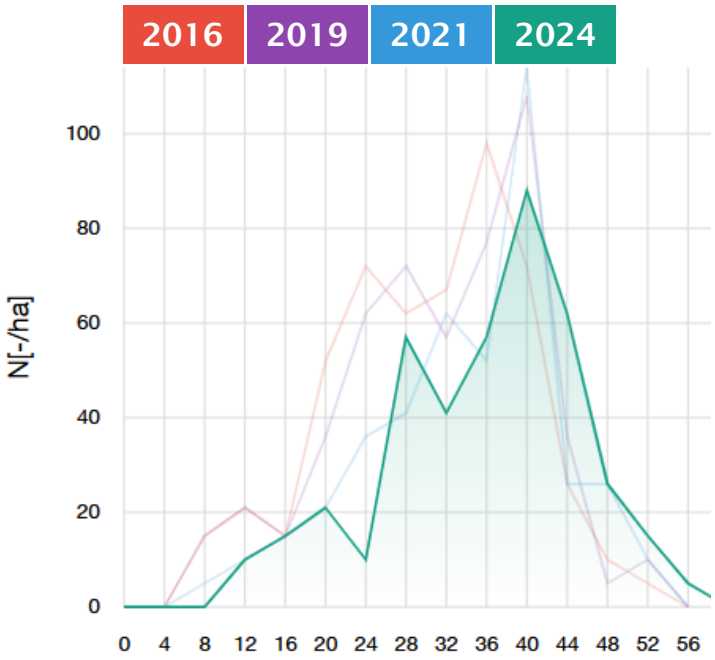



*Prírode blízke manažmentové prístupy a moderné technológie pre podporu biodiverzity*

## Stem distribution by diameter classes

### Surveyed trees




## Main dendrometric values with increment calculation

| | ddom | dg | n | g | v |
|---|---|---|---|---|---|
| 31.08.2016 | 43.6 | 33.1 | 516.5 | 44.4 | 565.6 |
| increament | 0.4 | 0.3 | - | 1 | 12.4 |
| 04.09.2019 | 45.0 | 34.2 | 516.5 | 47.5 | 605.4 |
| increament | 0.6 | 1.3 | - | 1.5 | 18.4 |
| 10.12.2021 | 46.3 | 36.9 | 418.4 | 44.8 | 570.2 |
| increament | 0.6 | 0.6 | - | 1.3 | 15.9 |
| 04.09.2024 | 48.2 | 38.6 | 408.1 | 47.8 | 608.0 |

## Harvest, mortality and ingrowth between two dendrometric surveys

| 31.08.2016 - 04.09.2019 | Harvest, mortality | Ingrowth | 04.09.2019 - 10.12.2021 | Harvest, mortality | Ingr |
|---|---|---|---|---|---|
| N | | | N | 98 | |
| dg | | | dg | 27 | |
| H | | | H | 0.79 | |
| %G | | | %G | 12 | |
| V | | | V | 72 | |

# Utility of marteloscopes:

- Link dendrometric values with concrete situations in the forest
- Consolidate dendrometric value estimation for precise description of a given silvicultural situation and for meaningful comparison with other situations
- Explore different silvicultural options, train (new) silvicultural techniques
- Share, compare and discuss tree marking with other forest professionals
- Set up a follow-up based on dendrometric survey and/or visual documentation … no need to wait too long, already possible to observe the effects of an intervention after a few years

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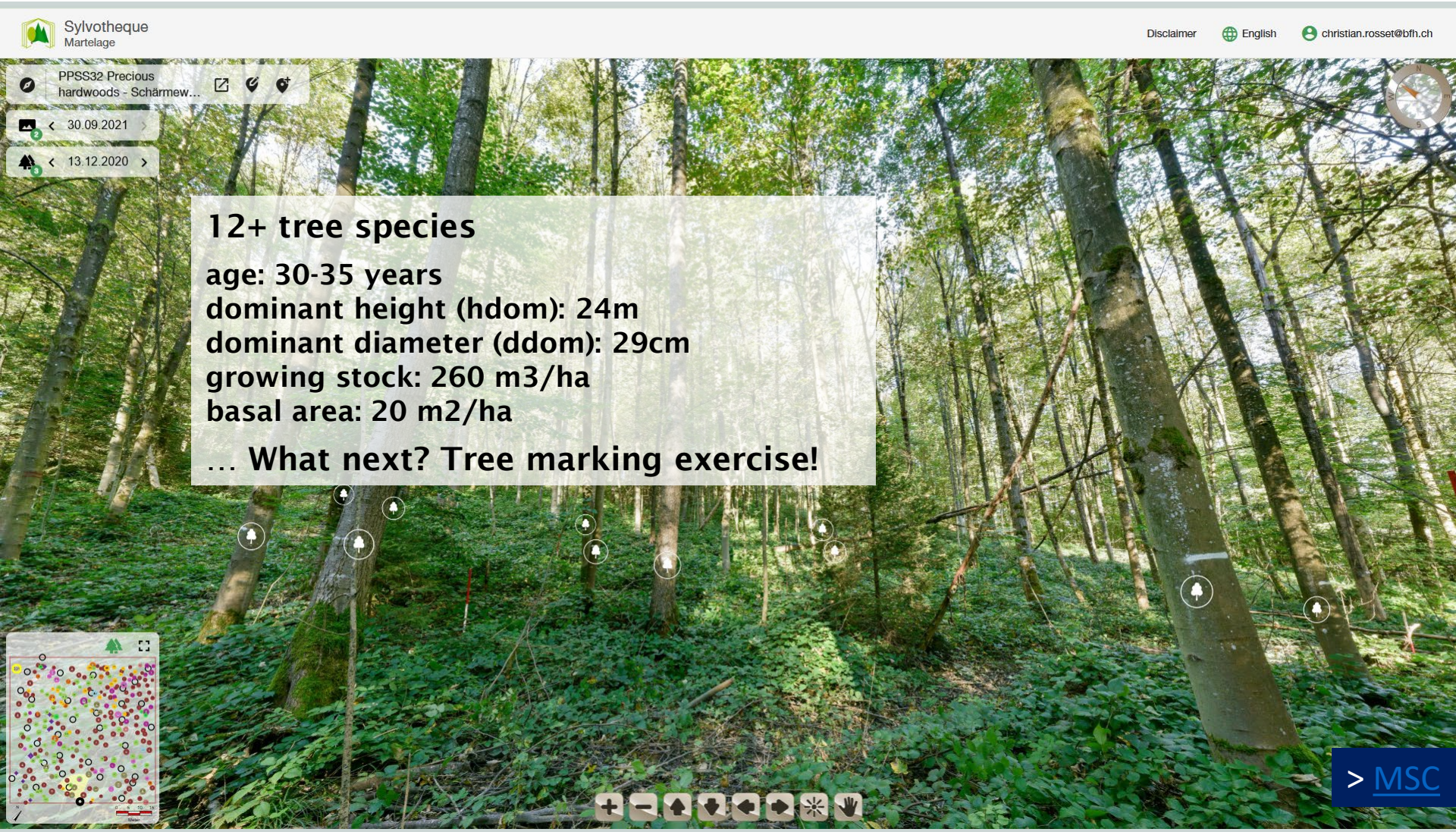
Sylvotheque
Martelage
Disclaimer
English
christian.rosset@bfh.ch
PPSS32 Precious hardwoods - Schärmew...
30.09.2021
13.12.2020
12+ tree species
age: 30-35 years
dominant height (hdom): 24m
dominant diameter (ddom): 29cm
growing stock: 260 m3/ha
basal area: 20 m2/ha
… What next? Tree marking exercise!
> MSC

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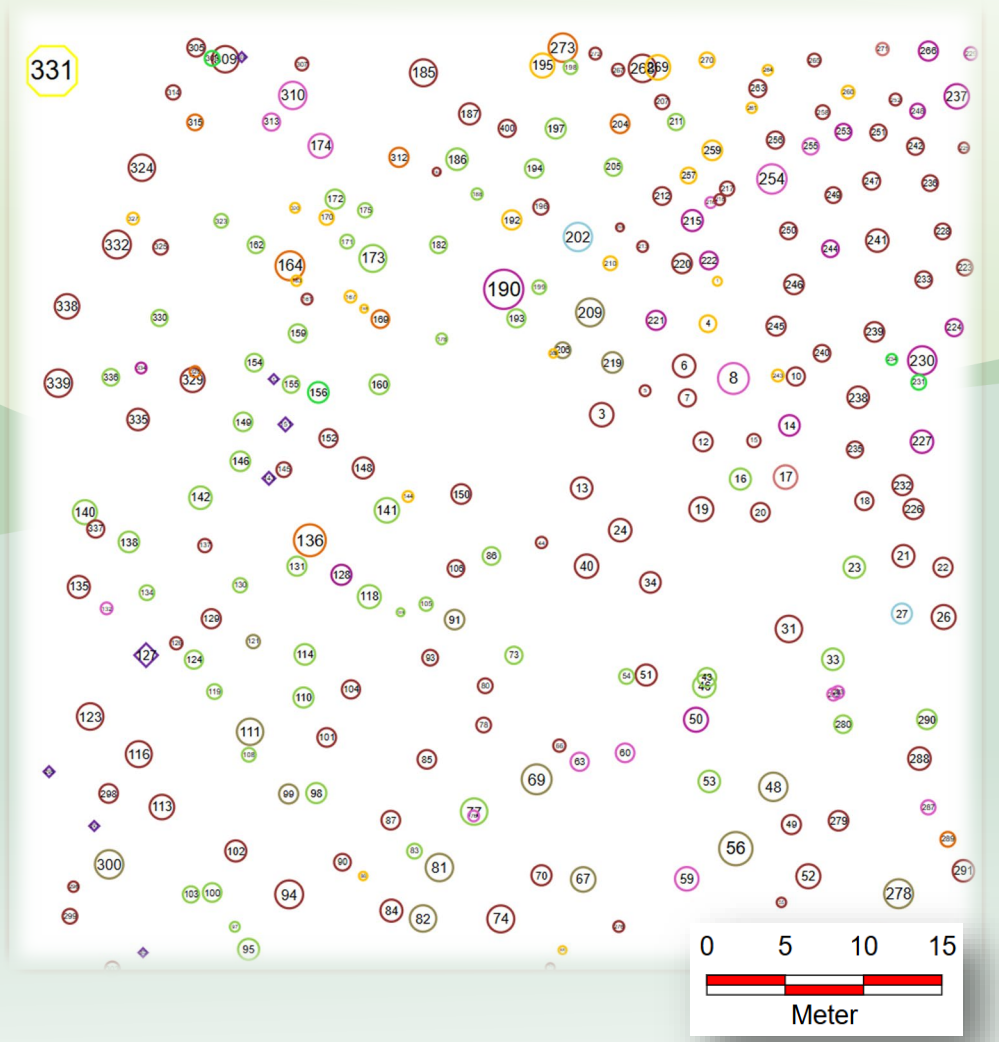


| | | |
|---|---|---|
| Douglas | douglaska tisolistá | 2.5% |
| Wild cherry | třešeň ptačí | 7.4% |
| Black alder | olše lepkavá | 9.7% |
| Oak | dub | 4.3% |
| Elm | jilm | 5.9% |
| Silver birch | bříza bělokorá | 1.2% |
| Sycamore maple | javor klen | 40.6% |
| Ash | jasan ztepilý | 19.7% |
| Beech | buk lesní | 4.6% |
| Norway maple | javor mléč | 1.3% |
| Spruce | smrk ztepilý | 1.4% |
| Lime tree | lípa | 1% |
| Bird cherry | střemcha obecná | 0.4% |

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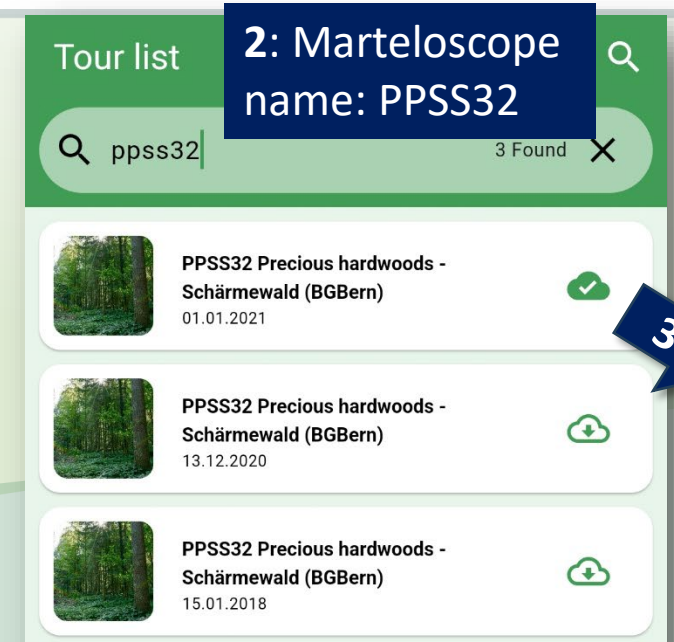
# MSC Mobile

## Android

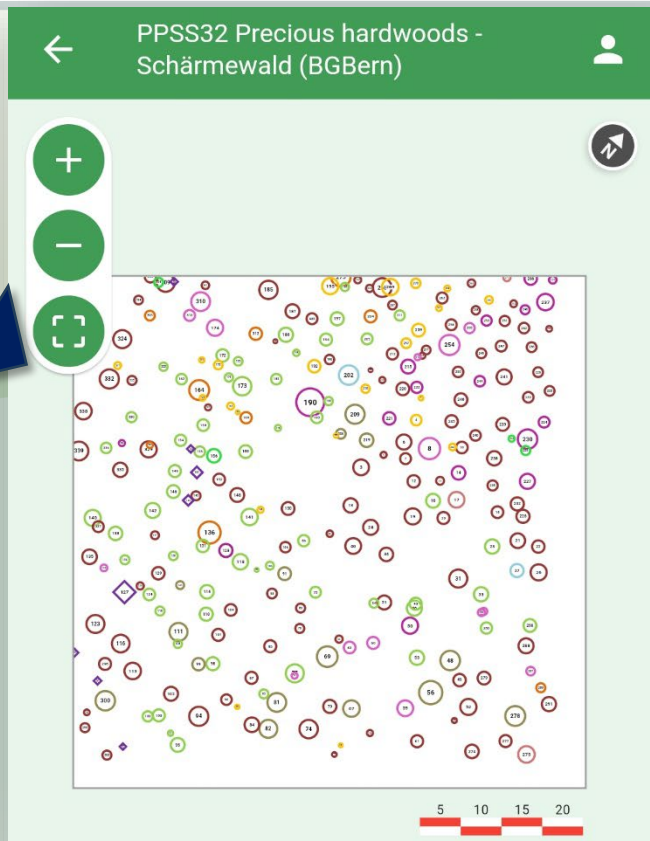
## iOS

**2**: Marteloscope name: PPSS32




**1**

**3**



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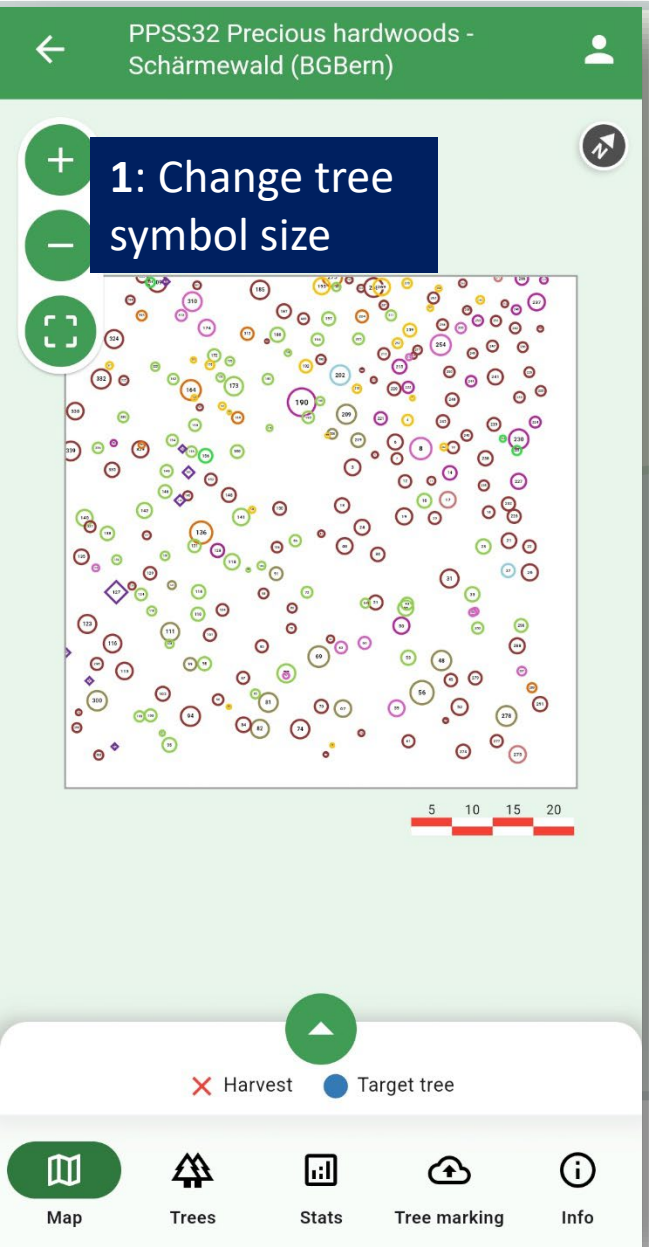
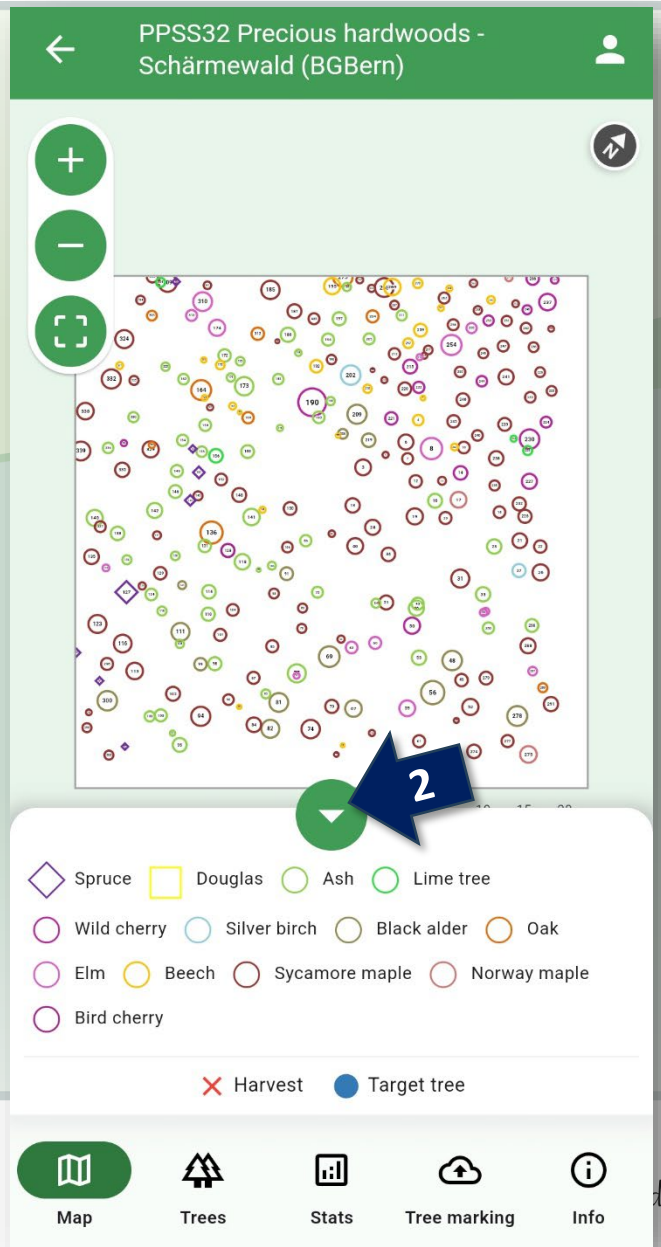
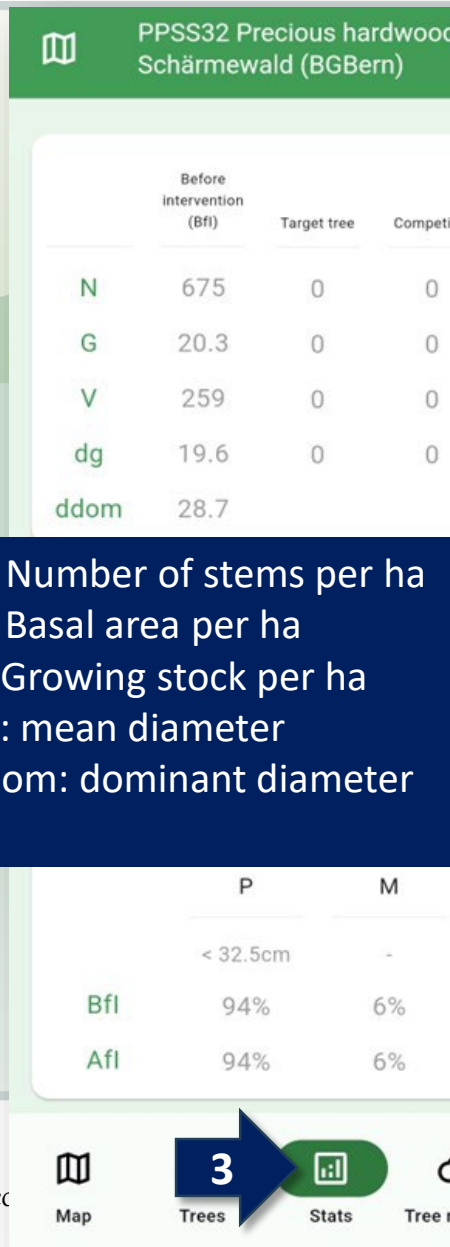
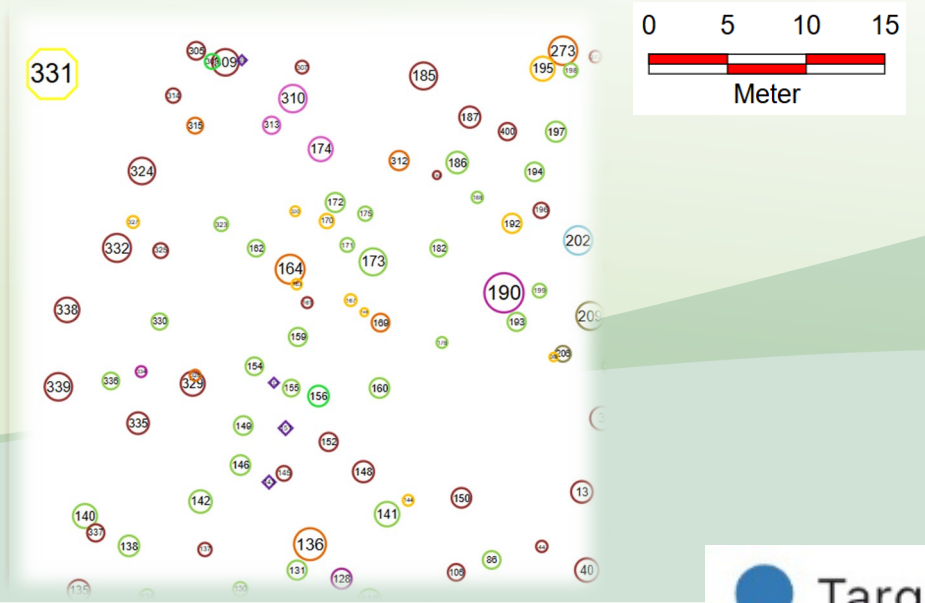


| | |
|---|---|
| Douglas | douglaska tisolistá |
| Wild cherry | třešeň ptačí |
| Black alder | olše lepkavá |
| Oak | dub |
| Elm | jilm |
| Silver birch | bříza bělokorá |
| Sycamore maple | javor klen |
| Ash | jasan ztepilý |
| Beech | buk lesní |
| Norway maple | javor mléč |
| Spruce | smrk ztepilý |
| Lime tree | lípa |
| Bird cherry | střemcha obecná |




**Simplified tree marking exercise:**

1. Select 5-9 trees to maintain / promote (target trees) (5-7')

Information available: tree location, tree species, and tree diameter

2. Compare your results with those of your neighbours (7-10')

- Selected trees: what is the same, what is different, and why ?
- Way to proceed: which aspects were considered? same logic?
- Learnings?

| | |
|---|---|
| Douglas | douglaska tisolistá |
| Wild cherry | třešeň ptačí |
| Black alder | olše lepkavá |
| Oak | dub |
| Elm | jilm |
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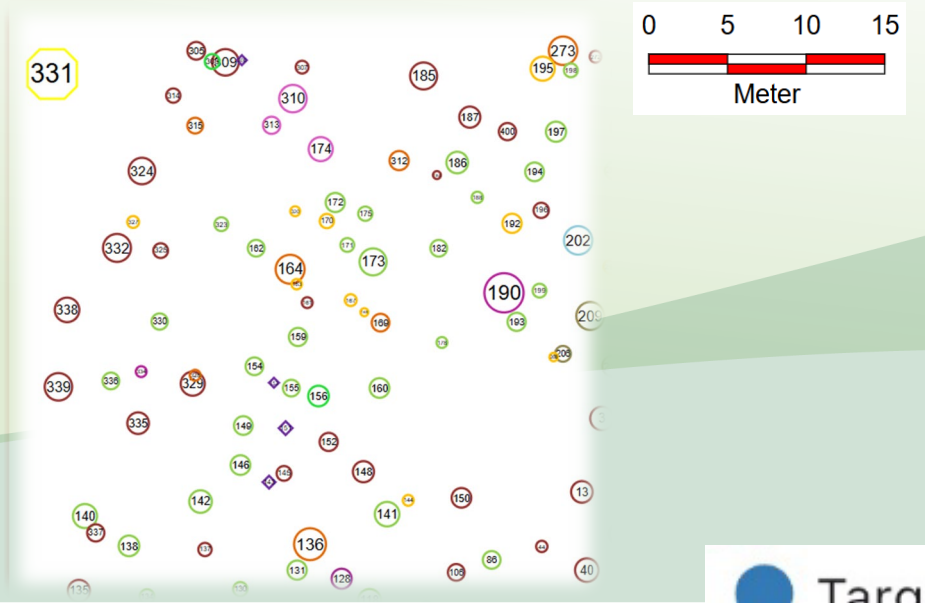


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Information available: tree location, tree species, and tree diameter

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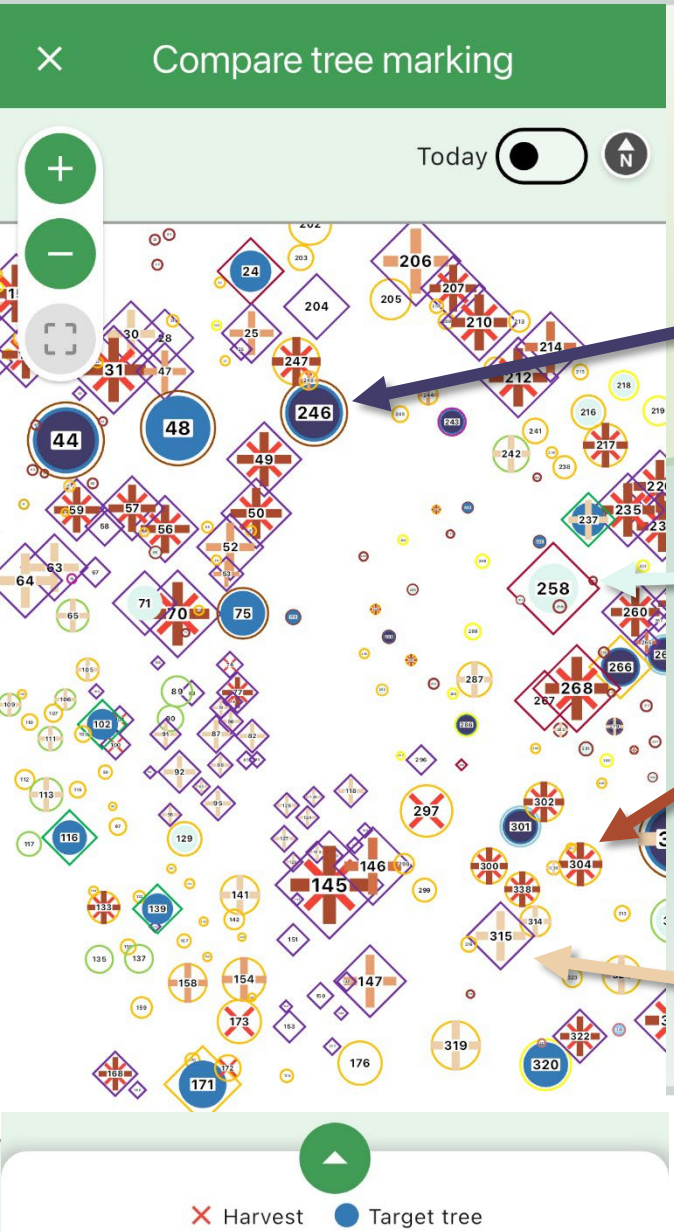
- Selected trees: what is the same, what is different, and why ?
- Way to proceed: which aspects were considered? same logic?

→ Stability and vitality, tree species composition, distance




## Possibility to share tree markings with QR codes and to compare them directly on an interactive map

- ]80%, 100%]
- ]50%, 80%]
- ]20%, 50%]
- ]0%, 20%]

**Percentage of times** the tree was selected as a **tree to maintain / promote** (target tree)

- ]80%, 100%]
- ]50%, 80%]
- ]20%, 50%]
- ]0%, 20%]

Number of times in % that the tree has been designated as a **tree to be harvested**

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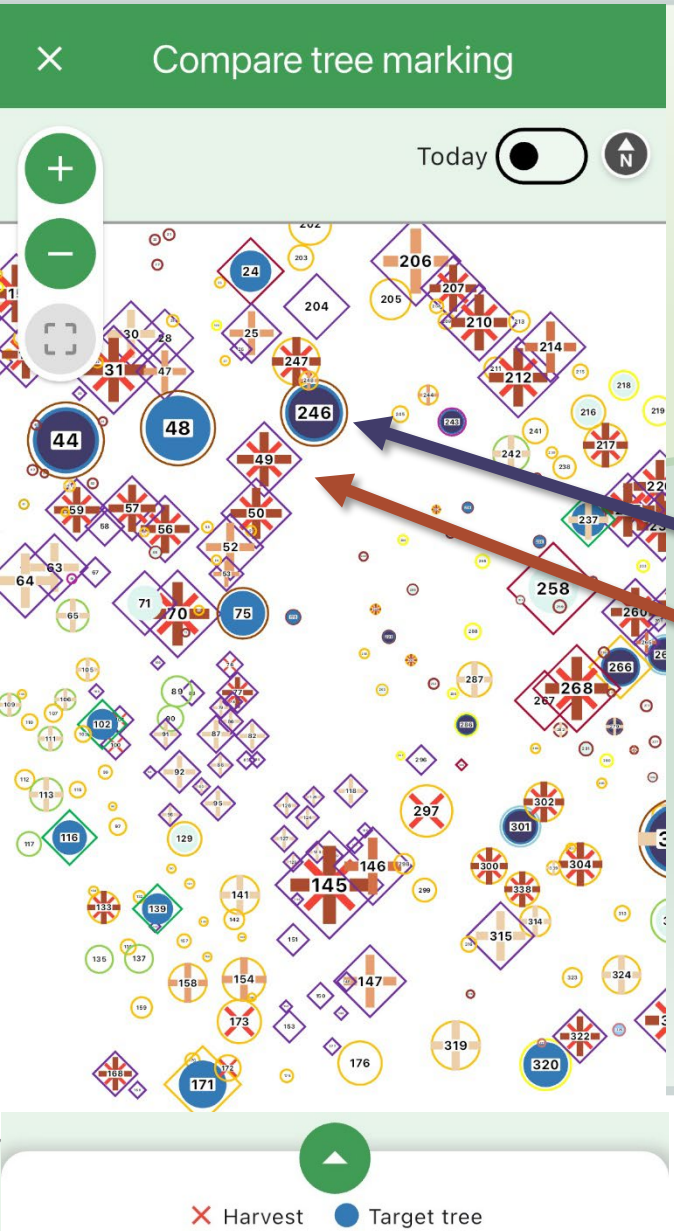
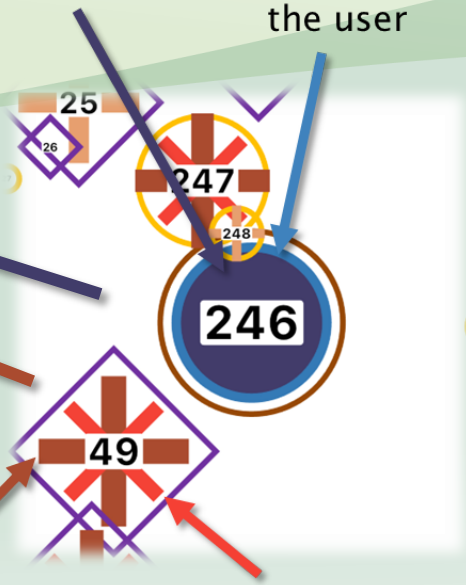



## Comparison with your own tree marking

80-100% of trees are marked as a target tree

Tree marked as a target tree by the user




Tree marked in 50-80% of cases +

Tree marked by user ×

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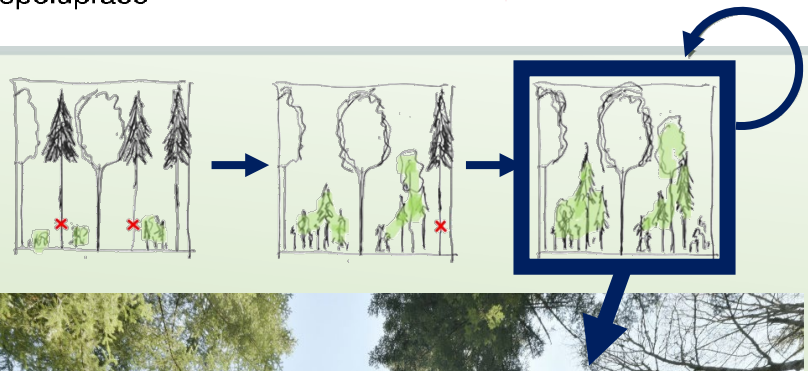
# Combining marteloscopes is very useful for observing and comparing forest dynamics and management practices …



**No intervention**

**?**

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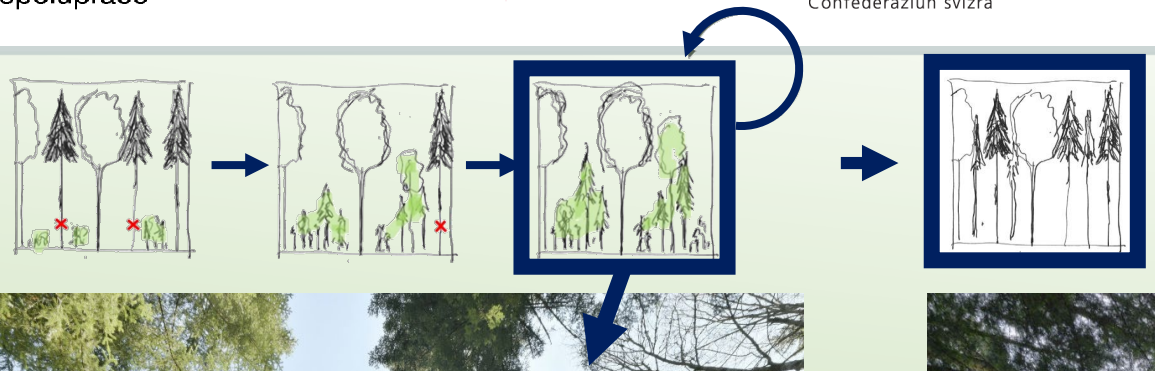

**No intervention**

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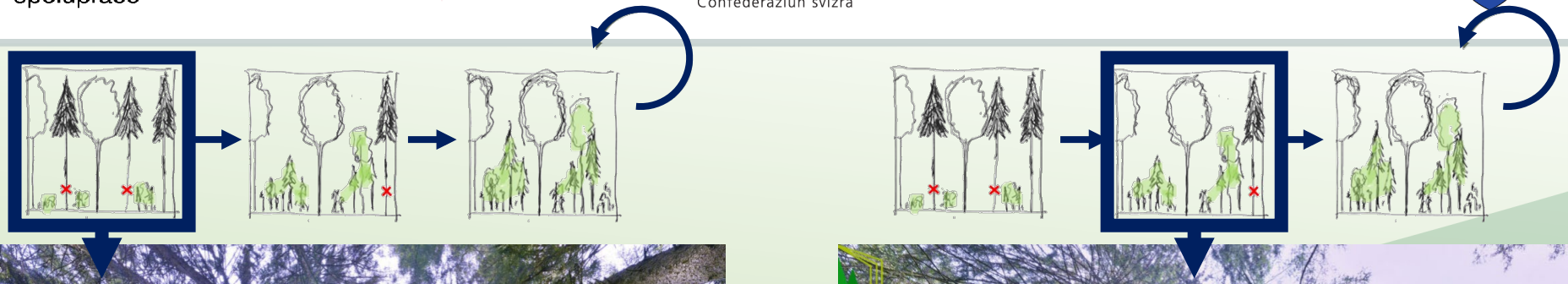

Stability /!\

Progressive and spatially dispersed establishment of natural regeneration, through the repeated creation of small canopy gaps, to gradually build vertical stand structure

No tree in the middle storey

Trees in the middle storey

Relatively simple with shade-tolerant tree species … but what about other tree species?

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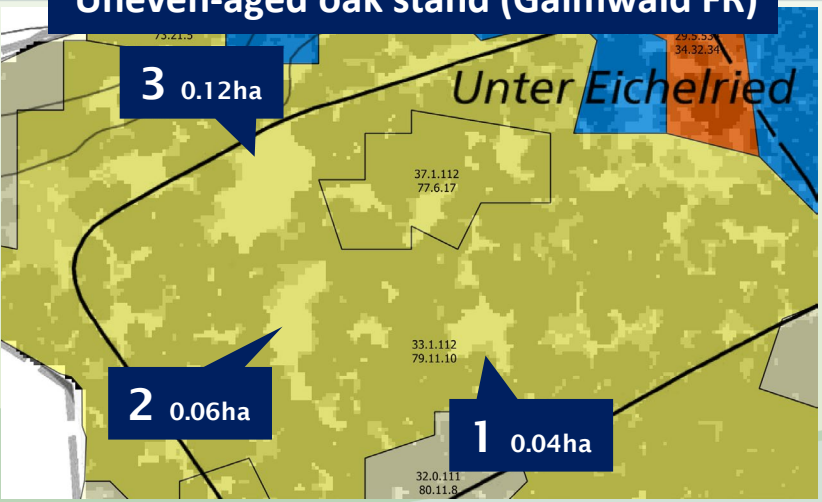
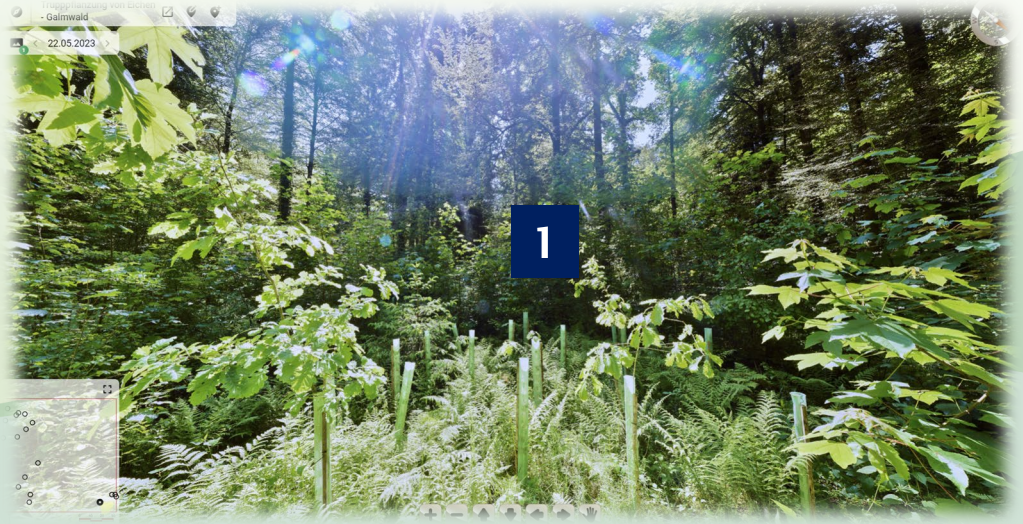
# Uneven-aged oak stand (Galmwald FR)



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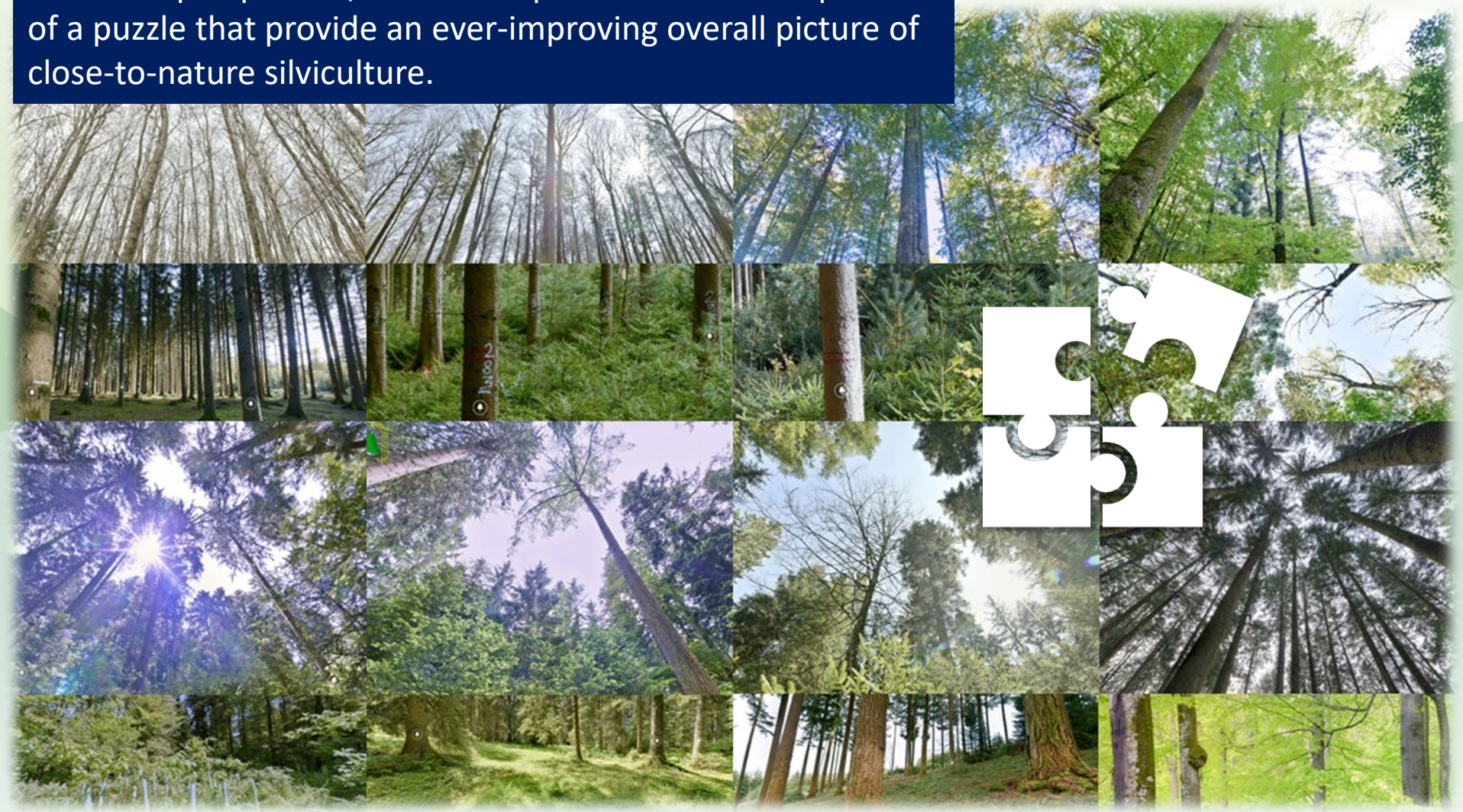
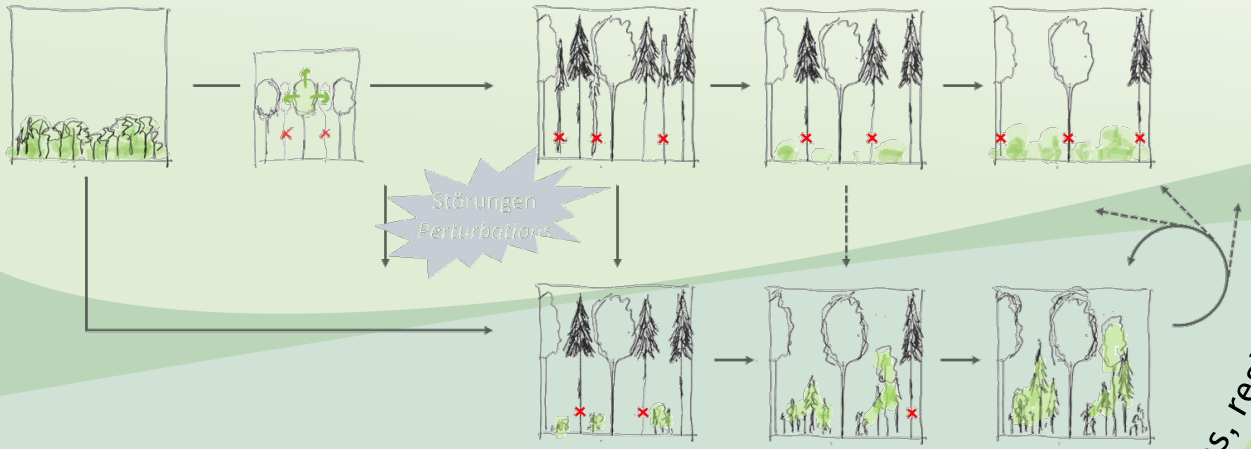
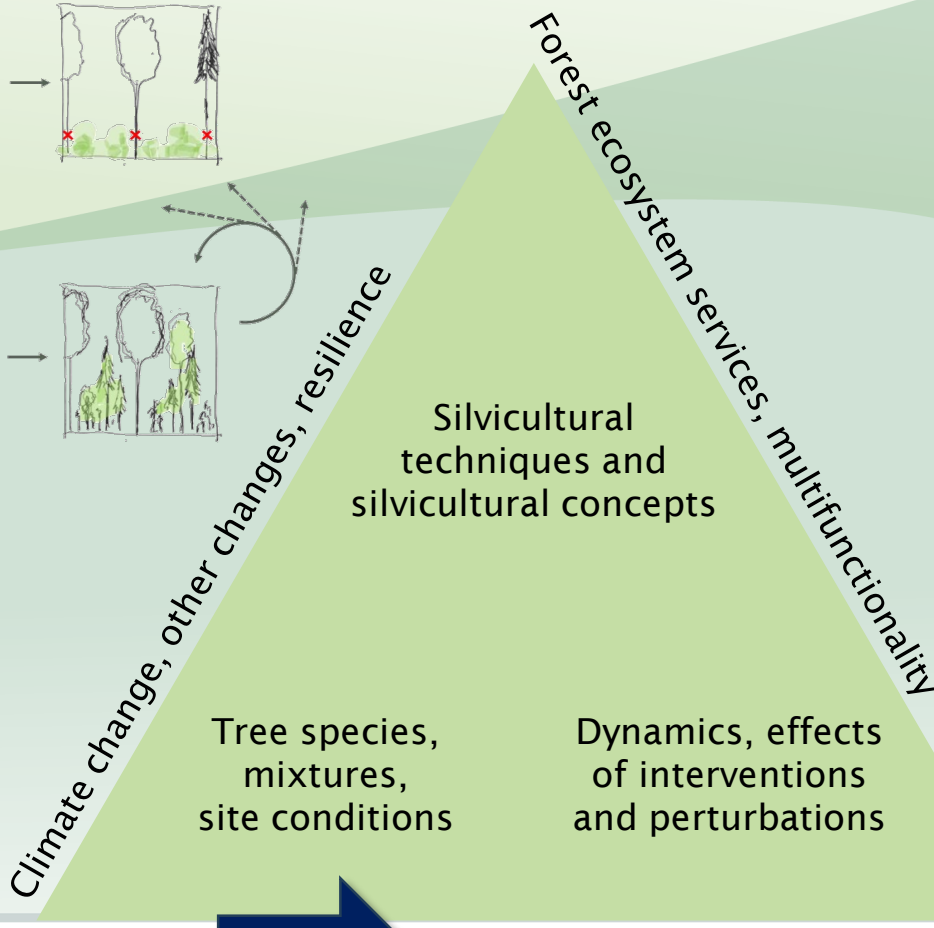
Combining marteloscopes is very useful for observing and comparing forest dynamics and management practices …

From this perspective, marteloscopes can be seen as pieces of a puzzle that provide an ever-improving overall picture of close-to-nature silviculture.



# Close-to-nature sylviculture > influencing natural processes, step by step with clear targets, based on facts and evidences …



# Do you see any Tree-related microhabitats?

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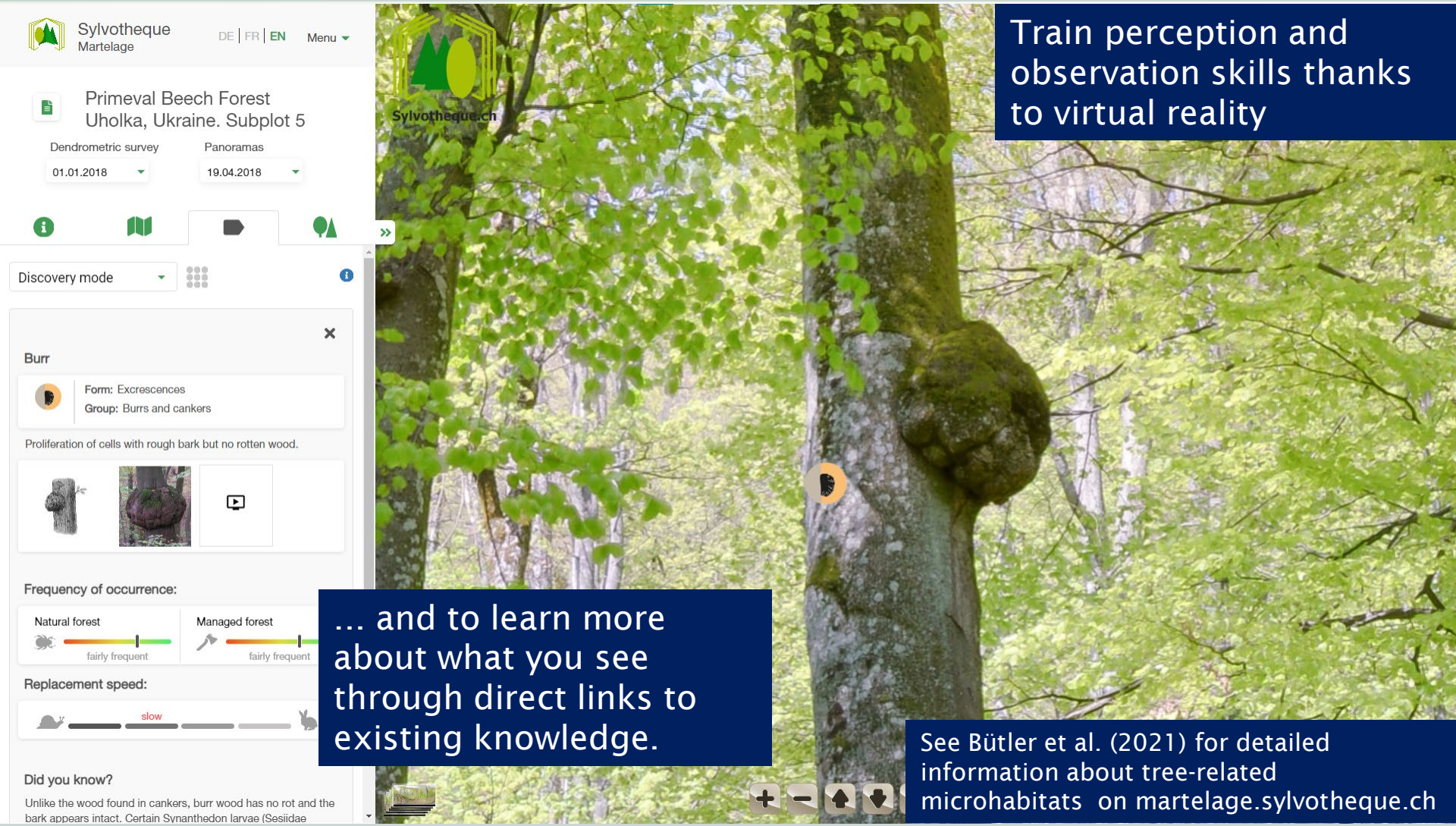
Sylvotheque
Martelage
DE | FR | EN
Menu
Primeval Beech Forest
Uholka, Ukraine. Subplot 5
Dendrometric survey
01.01.2018
Panoramas
19.04.2018
Discovery mode
Burr
Form: Excrescences
Group: Burrs and cankers
Proliferation of cells with rough bark but no rotten wood.
Frequency of occurrence:
Natural forest
fairly frequent
Managed forest
fairly frequent
Replacement speed:
slow
Did you know?
Unlike the wood found in cankers, burr wood has no rot and the bark appears intact. Certain Synanthedon larvae (Sesiidae
Sylvotheque.ch
Train perception and observation skills thanks to virtual reality
... and to learn more about what you see through direct links to existing knowledge.
See Bütler et al. (2021) for detailed information about tree-related microhabitats on martelage.sylvotheque.ch

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# Thank you for your attention !

**Martelage.sylvotheque.ch** is supported by the Federal Office for the Environment (FOEN), the Canton of Geneva, and Bern University of Applied Sciences (BFH).

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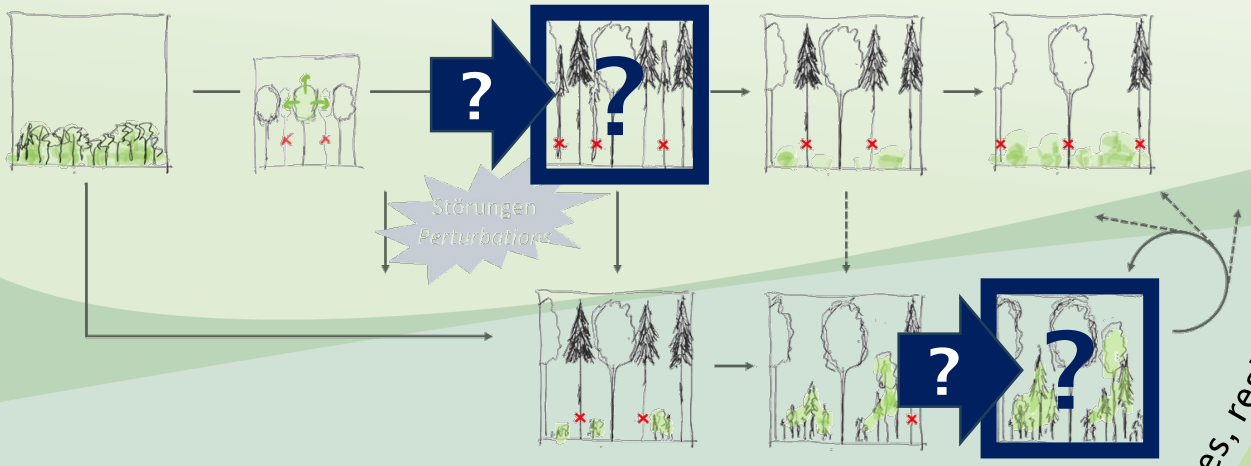
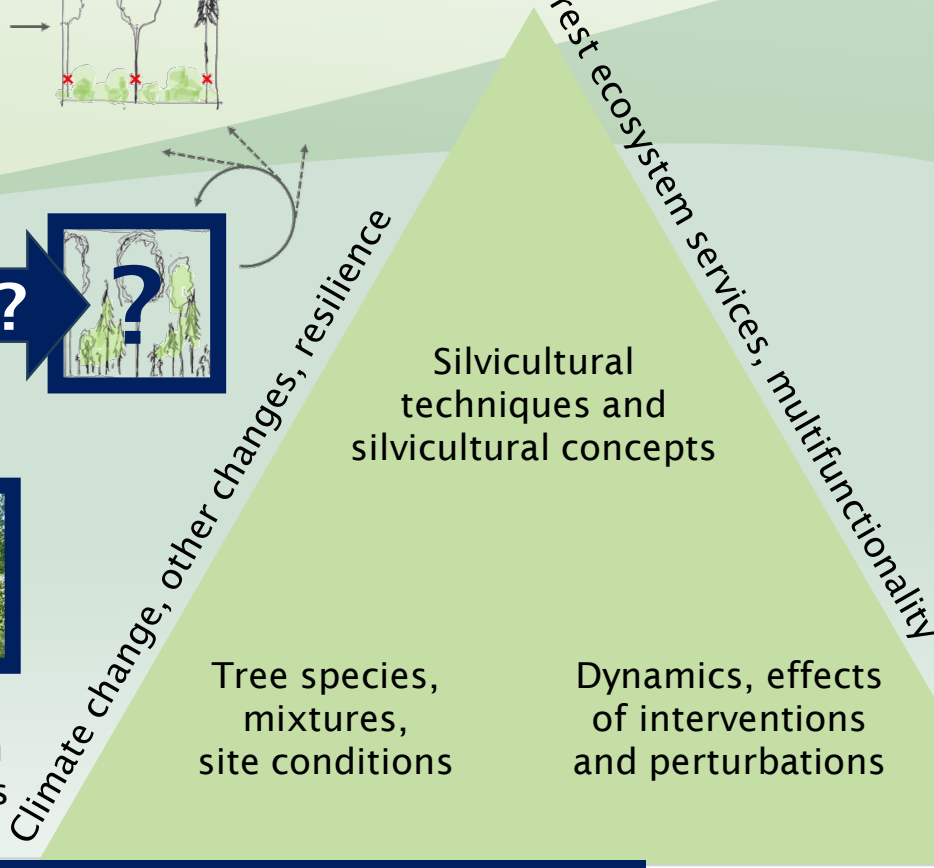
# Close-to-nature sylviculture > influencing natural processes, step by step with clear targets, based on facts and evidences …



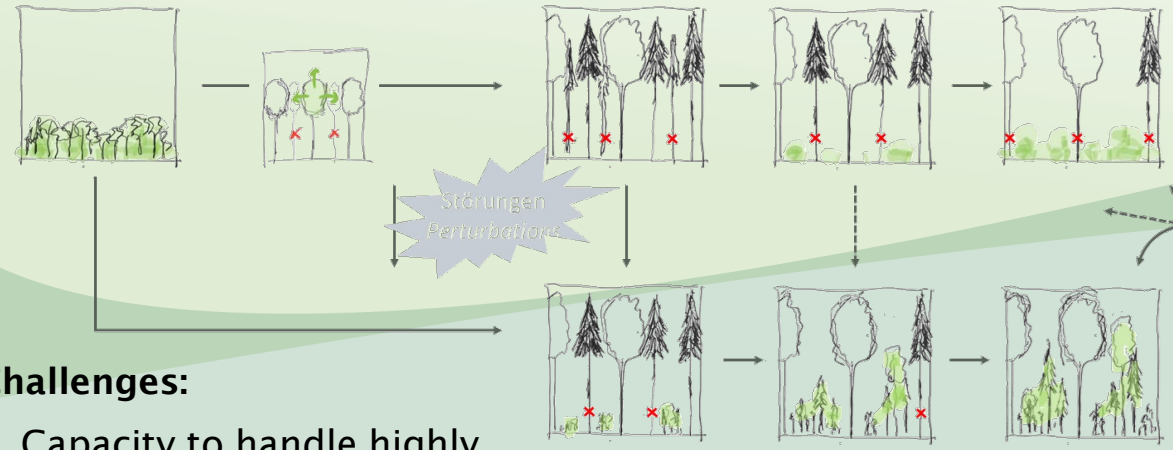

- What are meaningful targets? … Which is the most appropriate?


- How to reach these targets efficiently?
  … Which silvicultural techniques to apply, with which expected effects and how to coordinate interventions over time?



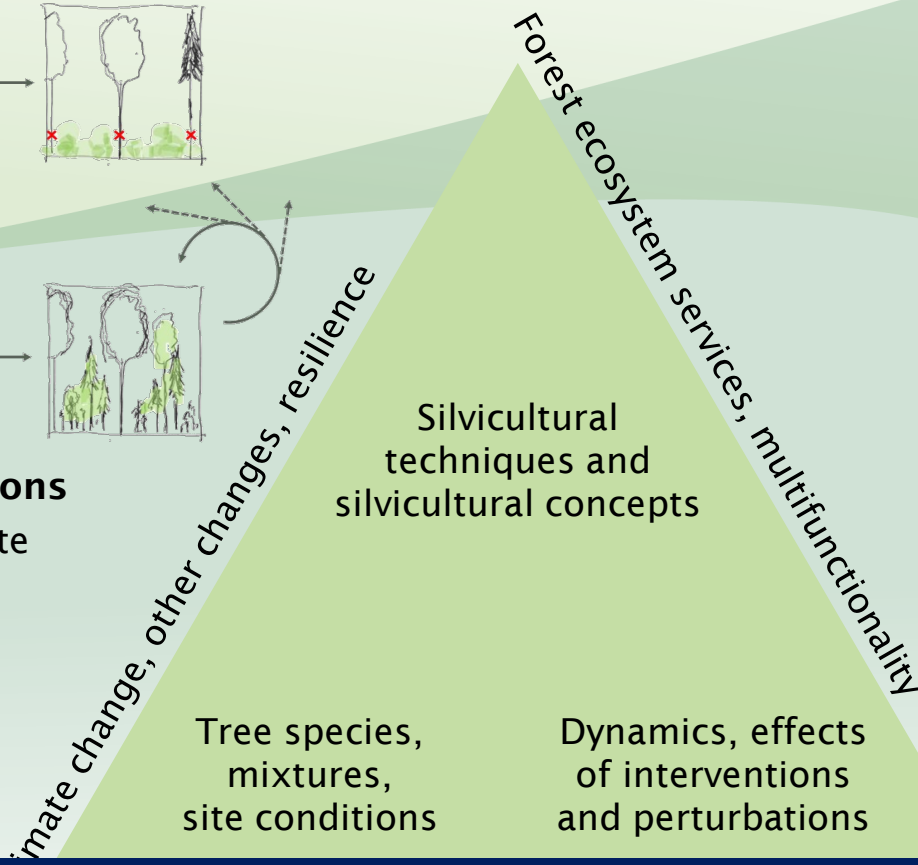

**Marteloscopes are very useful for discussing these questions and answering them concretely**

# Close-to-nature sylviculture > influencing natural processes, step by step with clear targets, based on facts and evidences …




**Challenges:**

- Capacity to handle highly **complex** systems and to face **many diverse situations**
- Capacity to understand **stand dynamics** and anticipate **possible development** for different **targets**
- Capacity to apply a broad range of **silvicultural techniques** to **influence** natural processes
- Capacity to **coordinate** silvicultural interventions over time to efficiently provide **relevant forest ecosystem services**
- Capacity to **adapt** to major **change**




Marteloscopes are very useful to develop these skills further, especially for training observation skills, accumulating experience, and sharing with others based on concrete facts

# Thank you for your attention !

SilvaTech4Trees

# Main motivation behind martelage.sylvotheque.ch (MSC)

- to document the diversity of forests and to illustrate the variety of close-to-nature silviculture practices
- to strengthen the understanding of forest ecosystems, their dynamics and how to influence these dynamics through concrete cases
- to facilitate tree marking exercises in a large number of different situations and to promote sharing between forest professionals
- to characterize and quantify silvicultural practices, monitor their effectiveness, compare and optimise them, formalise and document silvicultural know-how

Marteloscopes represent the key ingredient; they can be seen as pieces of a puzzle that provide an ever-improving overall picture of close-to-nature silviculture

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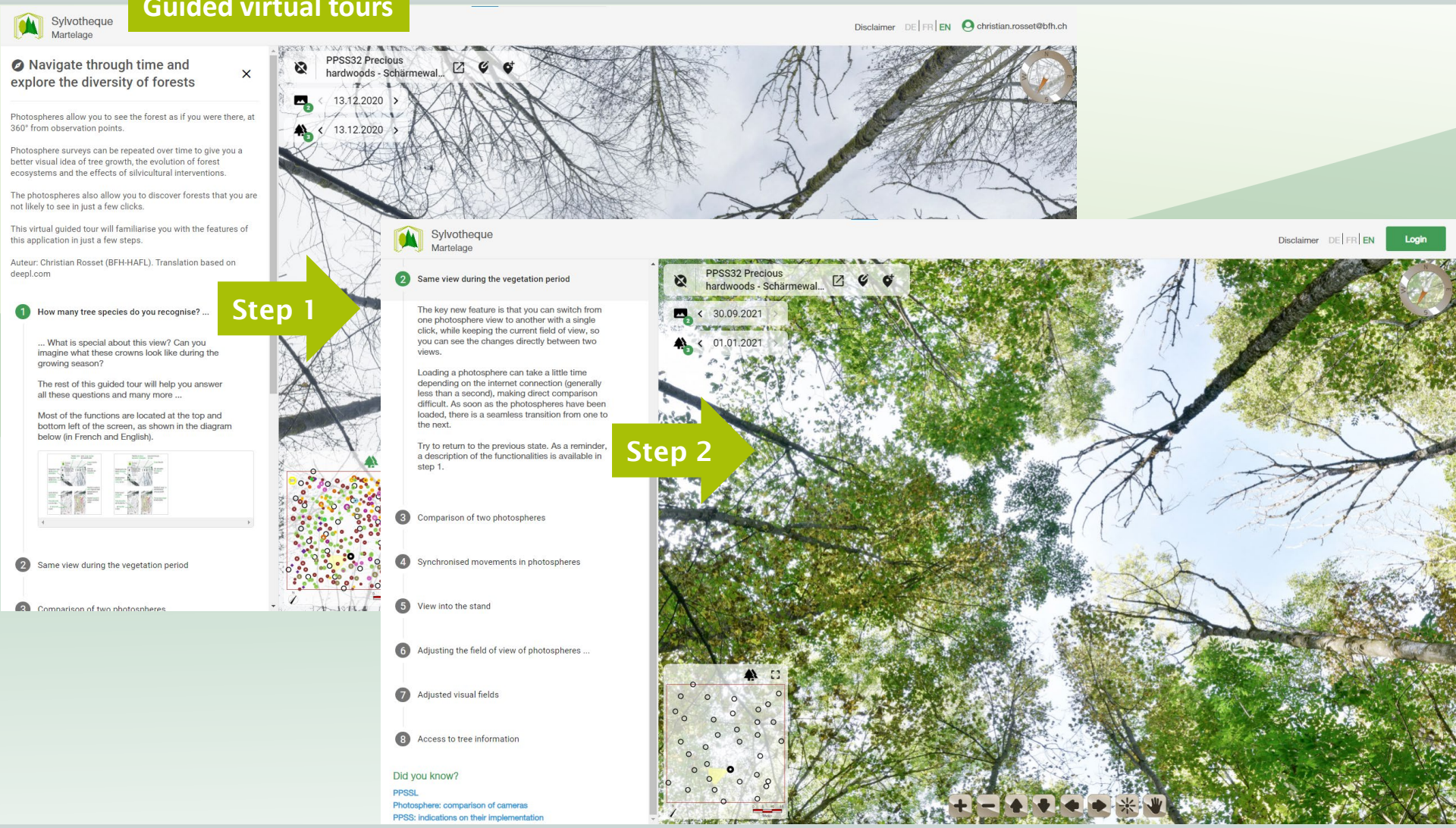
# Guided virtual tours

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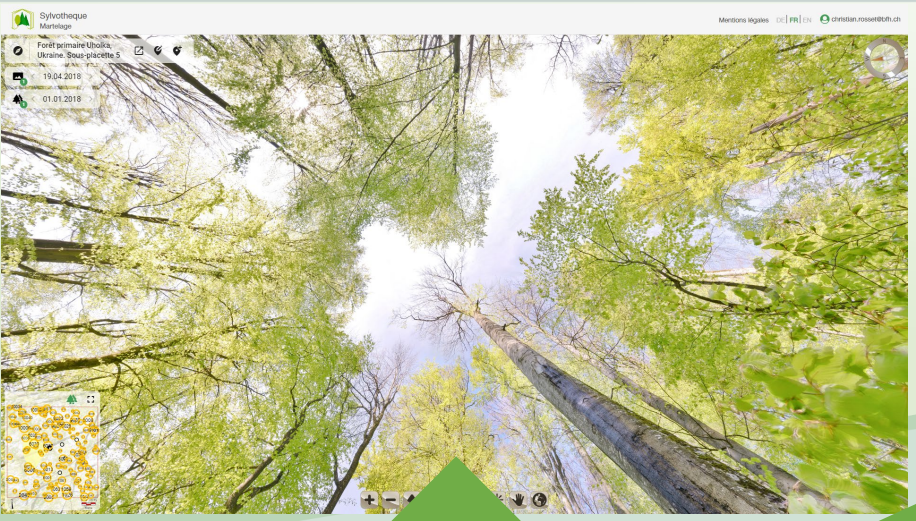
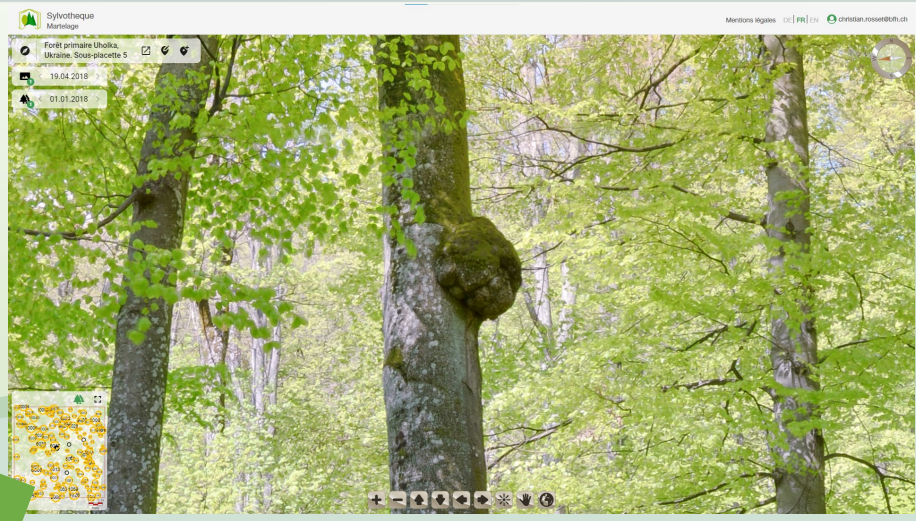
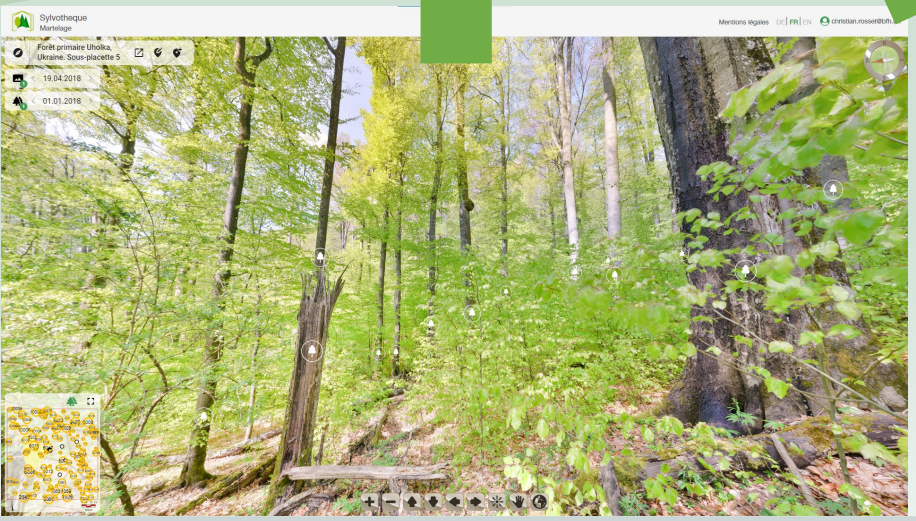



zoom





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# ProSilvaSwitzerland – what we do

As a **grassroots** and user organisation, ProSilva develops highly practical silvicultural knowledge across language, cantonal and, last but not least, ownership boundaries.

- We organise **training courses and excursions**, and in particular yearly tree marking exercises.
- We promote **exchange** with other practicians and experts.
- We develop working **tools** such as our booklet «A brief guide to Continuous Cover Forestry»

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# Programm 2026

| Datum | Veranstaltung | Ort | Thema |
|---|---|---|---|
| 30. April | Mitgliederver-sammlung + Exkursion | Boudry NE | Vortrag: «Dauerwald und Klimawandel – wohin gehen wir?» Exkursion: «Waldbau inspiriert von Geschichte und Natur» |
| 03. - 05. Juni | Studienreise | Sargans Bündner Herrschaft Surses/Forna | Dauerwald und Gebirgswaldpflege |
| 2. Juli 7. Juli 9. Juli | Praxiskurse | Glarus Nord Seon AG Neuchâtel | Einführung in den Dauerwald-Forstbe-trieb für Betriebsleiter:innen und Praktikant:innen |
| 15. und 16. Oktober | Anzeichnungs-übung | Selzach Marteloskop Lehmannskreuz SO | Baumarten- und Strukturvielfalt am Ju-rasüdfuss: Waldbaulicher Umgang mit den Unsicherheiten des Klimawandels. |

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# Checkkarten

Der Dauerwald als Waldbauidee, Waldbild und Betriebsform hat sich in der Schweizerischen Waldwirtschaft etabliert und wird grossflächig angewendet. Ein Förster muss daher die Waldbauidee Dauerwald verstehen und anwenden können. Die Checkkarten Dauerwald sollen ihn dabei unterstützen. Sie sind Argumentarium und Gedankenstütze und sollen Impulse geben.

In die Checkkarten Dauerwald sind die Ideen und Erfahrungen vieler Personen eingeflossen. Sie sind erhältlich in Deutsch, Französisch, Italienisch und Englisch.


Die praktischen Anleitungen und Tipps, mit verständlichen

hirmfoto

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# Forest monitoring

> keep the big picture in mind


> map.admin.ch

Disturbances

# Forest management

> flexible steering and control

**20-100y+**
Long term forest development

**5-20y**
Coordination of interventions

WIS.2
Waldbauliches Entscheidungs-Unterstützungs-System

**Harvesting**
**0y**

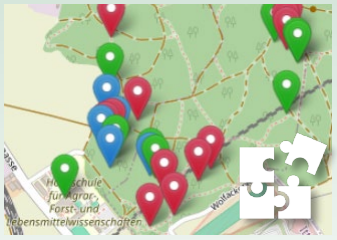
**Tree marking**
**1-5y**

Wood supply

**Silvicultural concepts**

# Silvicultural knowhow and knowledge management

> training, follow-up, optimisation and further development of silvicultural



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