



Kevin Frediani
FArborA

Counting Cavities, Not Just Canopies:
TreMs for Scotland's Ancient Trees



Tree ecology in practice: Managing populations of open grown trees





Tree Cover Outside Woodland – Key Facts (Britain)

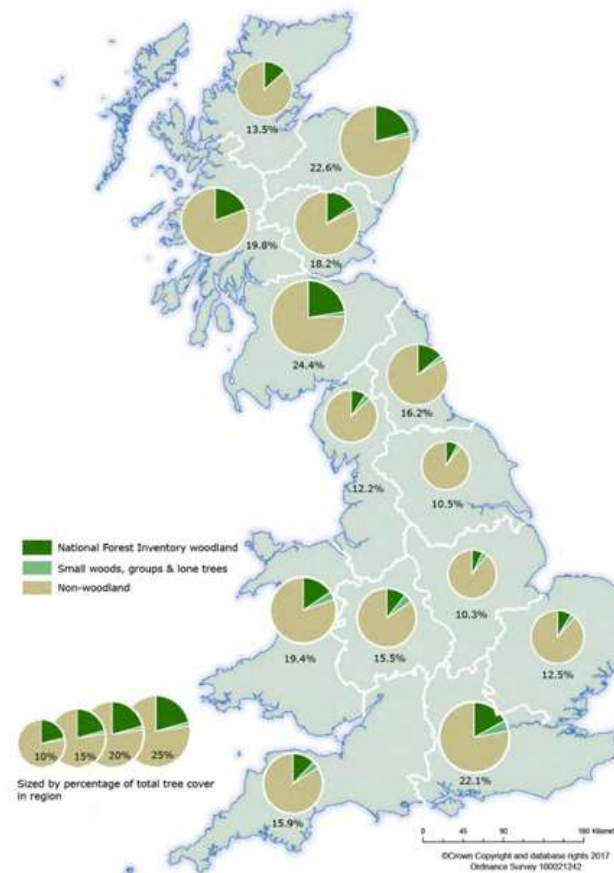
Total Non-Woodland Tree Cover est. 742 thousand hectares across Britain

- 565k ha in England
- 84k ha in Scotland
- 93k ha in Wales

Open grown (lone) trees:
97 thousand hectares of canopy from lone trees

- England 78k ha
- Scotland 9k ha
- Wales 10k ha

Note: NFI woodland occupies just over 3 million hectares or 13.4 % of Britain's land area. https://cdn.forestryresearch.gov.uk/2022/02/fr_tree_cover_outside_woodland_in_gb_statistical_report_2017.pdf



What makes an open grown tree different



Trees as living archives



Life history pathway

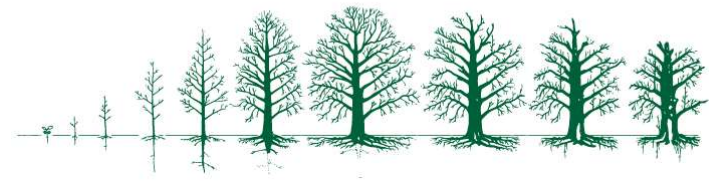
“The life cycle of a tree is conventionally considered to be a linear progression from seed to senescence – passing through developmental stages, from the juvenile, through the mature stage, culminating in death.

However, a linear view does not fully account for the subtleties of the complex and dynamic nature of ageing in trees.”

The ageing process: a morpho-physiological model of the life stages of a tree - Neville Fay, Nigel de Berker

Trees – a Lifespan Approach

Contributions to arboriculture
from European practitioners



Dirk Dujesiefken, Neville Fay
Jan-Willem de Groot, Nigel de Berker

Editors: Kamil Witkos-Gnach, Piotr Tyszko-Chmielowiec

Microhabitats (TreMs): The ecological currency

Towards the TreM concept



From an
unstructured
towards a structured
approach for
inventory
standardisation

De Groot et al. 2016

6

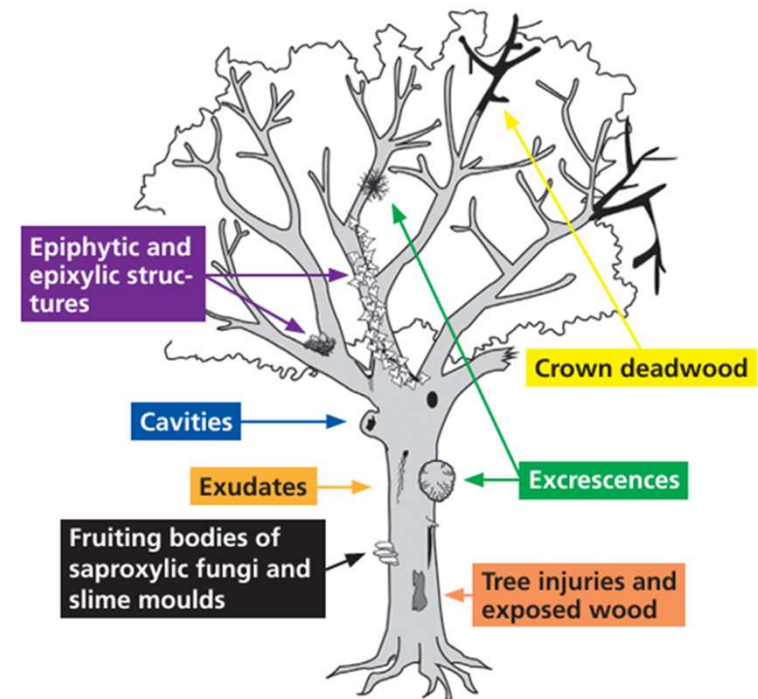
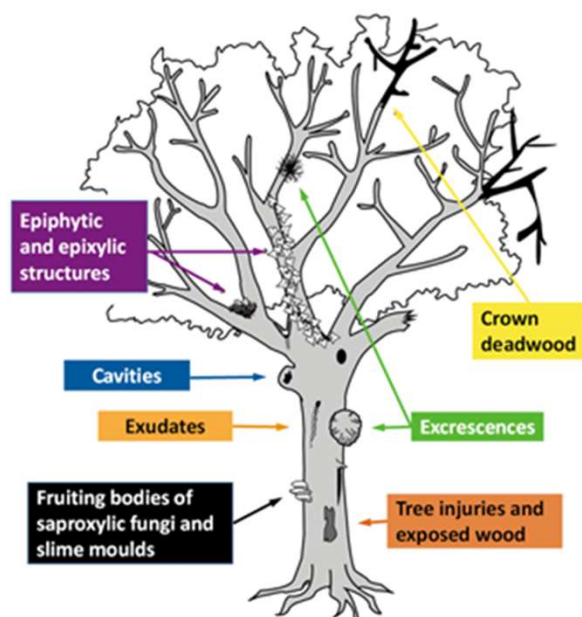


Fig. 1. A habitat tree bearing tree-related microhabitats essential to specialised species for shelter, breeding spots, hibernating or feeding, or even for their entire life cycle.

2018: publication of the TreM typology => common vocabulary and definitions



A «**habitat tree**» is a living or dead standing tree that bears at least one TreM.

Bütler et al. 2013, 2020



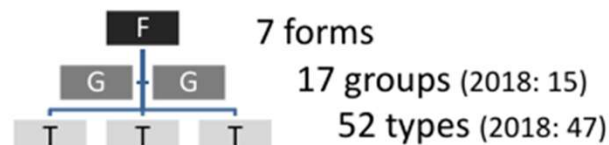
Tree related microhabitats in temperate and Mediterranean European forests: A hierarchical typology for inventory standardization

Laurent Larrieu^{a,b,c,d}, Yoan Paillet^a, Susanne Winter^{a,1}, Rita Bütler^a, Daniel Kraus^a, Frank Krumm^a, Thibault Lachat^{a,b}, Alexa K. Michel^a, Baptiste Regnery^{a,b}, Kris Vandekerckhove^d

Larrieu et al. 2018

➤ Definition for each TreM

➤ Hierarchical structure:



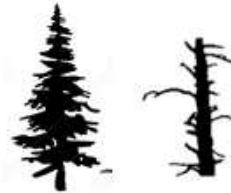
➤ Size thresholds

TreMs: definition

- distinct, well delineated structures



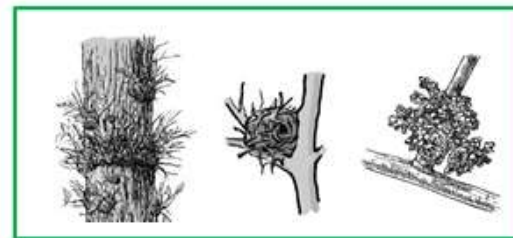
- borne by standing living or dead trees



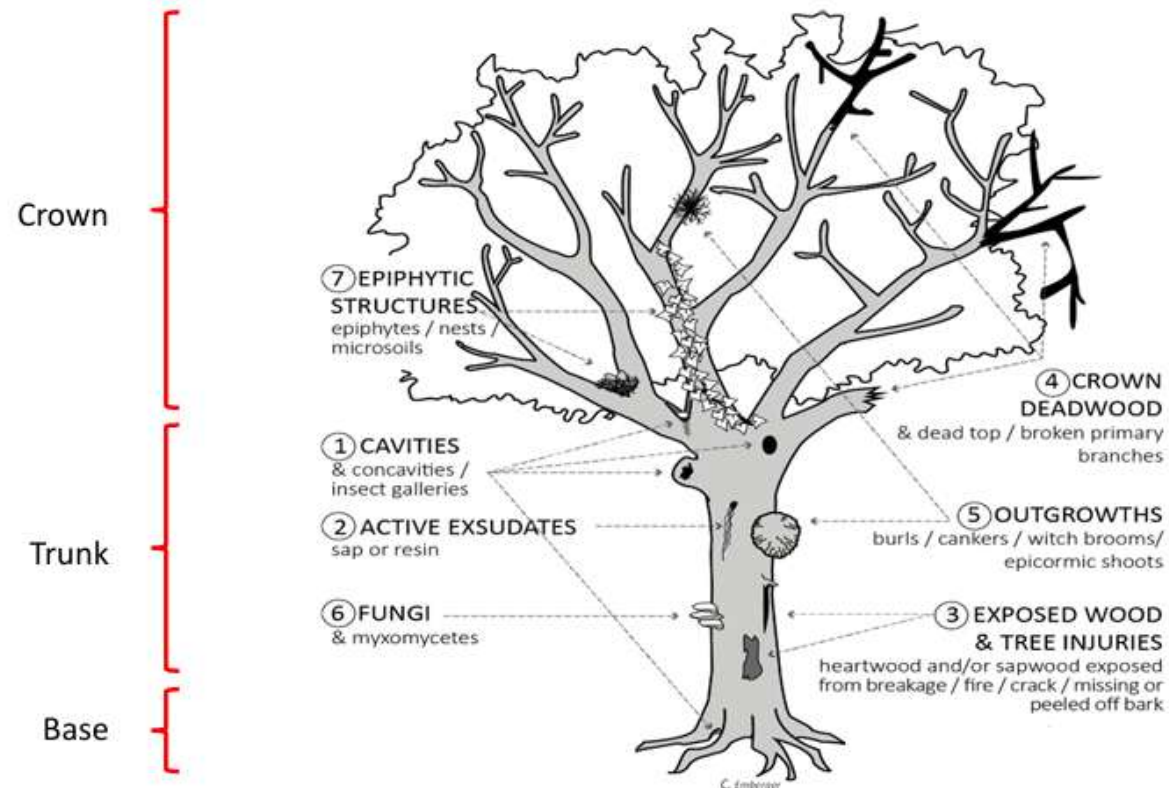
- essential substrates or life-sites for species



- encompassing decaying wood (=saproxylic TreM) or not (=epixylic TreM)



All parts of a tree can bear TreMs



Examples of TreMs



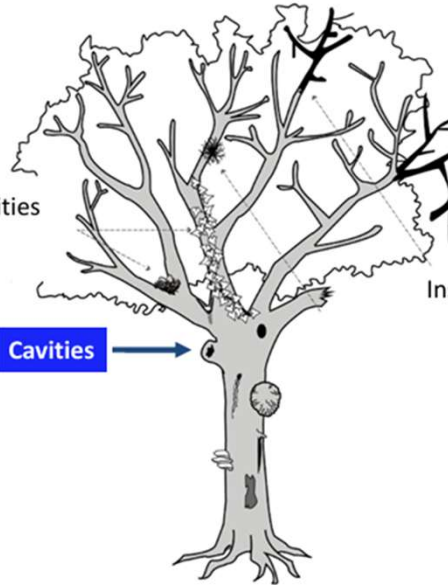
Woodpecker breeding cavities



Concavities



Rot-holes



Cavities

Insect galleries and bore holes

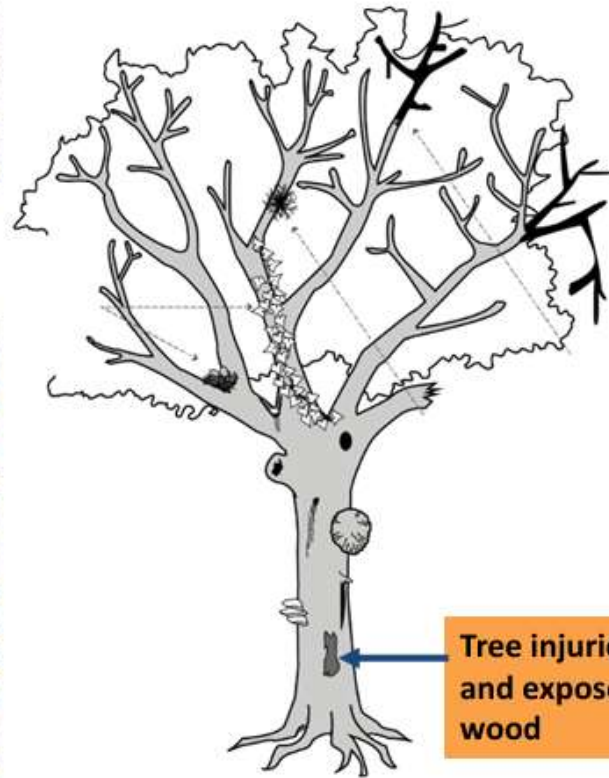




← Exposed sapwood only →

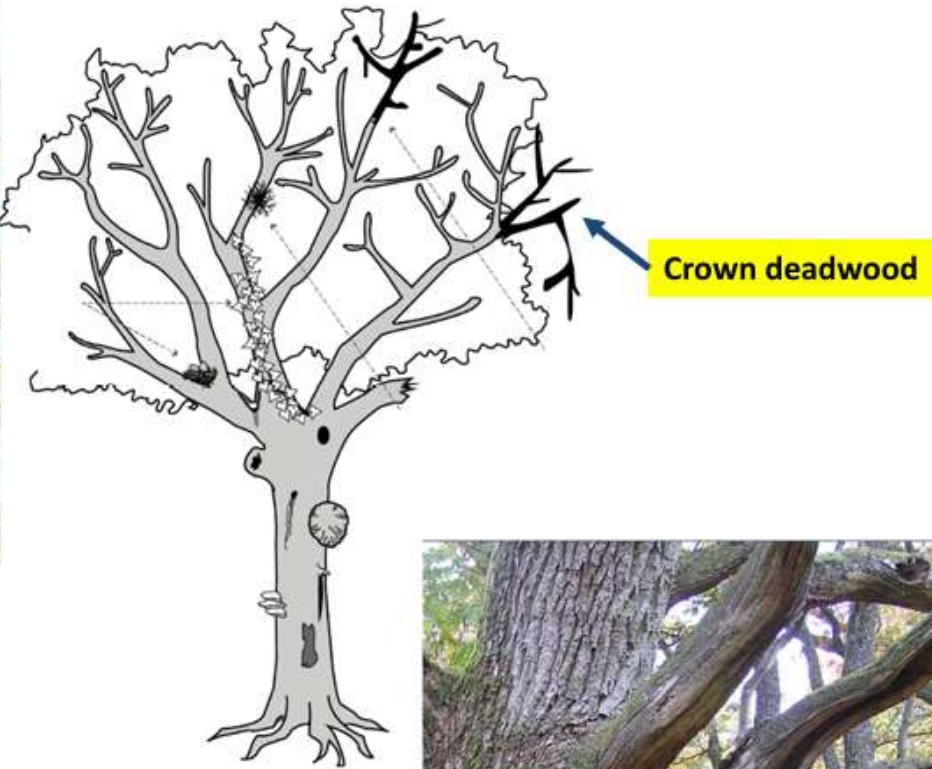


← Exposed sapwood and heartwood →



Tree injuries
and exposed
wood







Twig tangles
(Witches broom)



Galls



Excrecences

Burrs and cankers

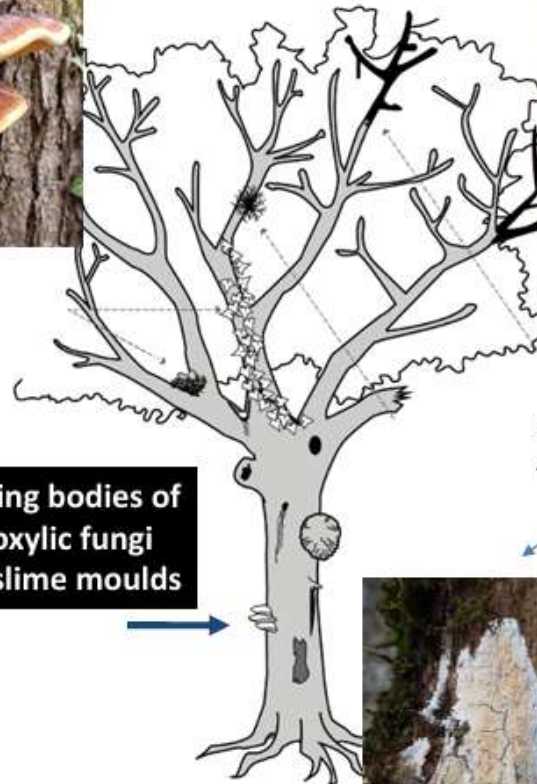




Perennial fungal
fruiting bodies



Ephemeral fungal
fruiting bodies



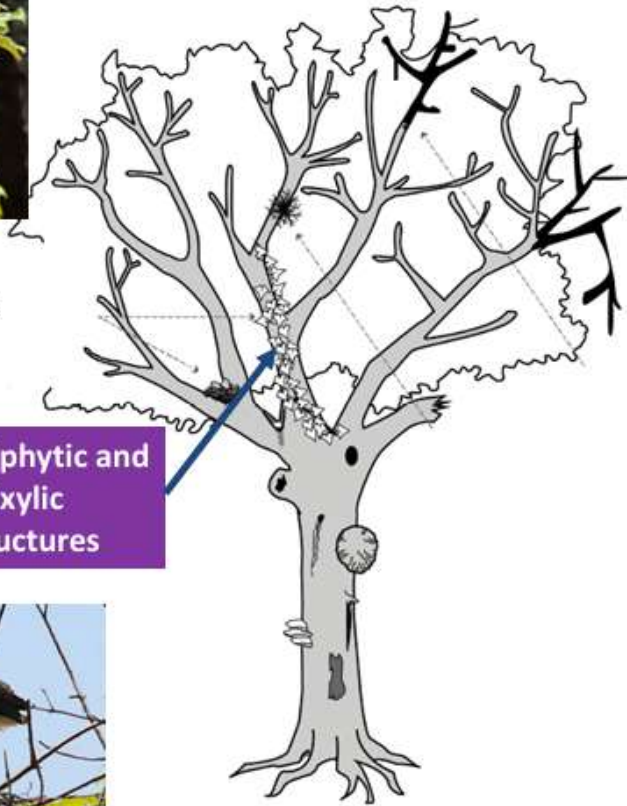
Fruiting bodies of
saproxylic fungi
and slime moulds

Slime moulds





Epiphytic and parasitic
crypto- and phanerogams



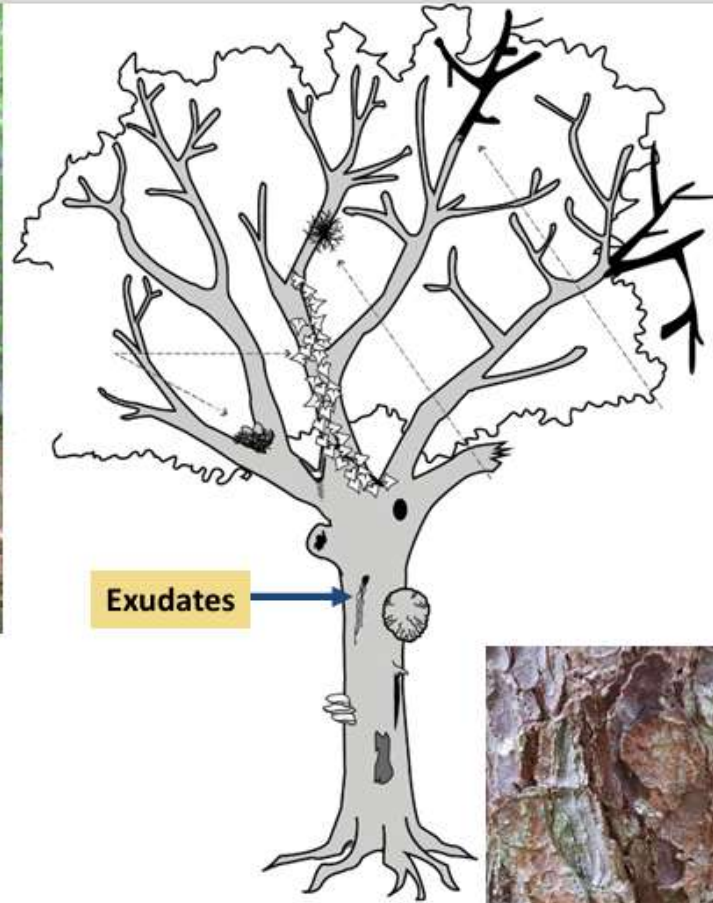
Microsoils

Nests



Alluvial deposits

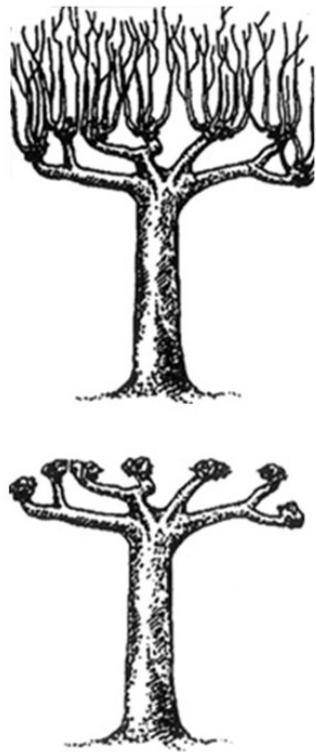




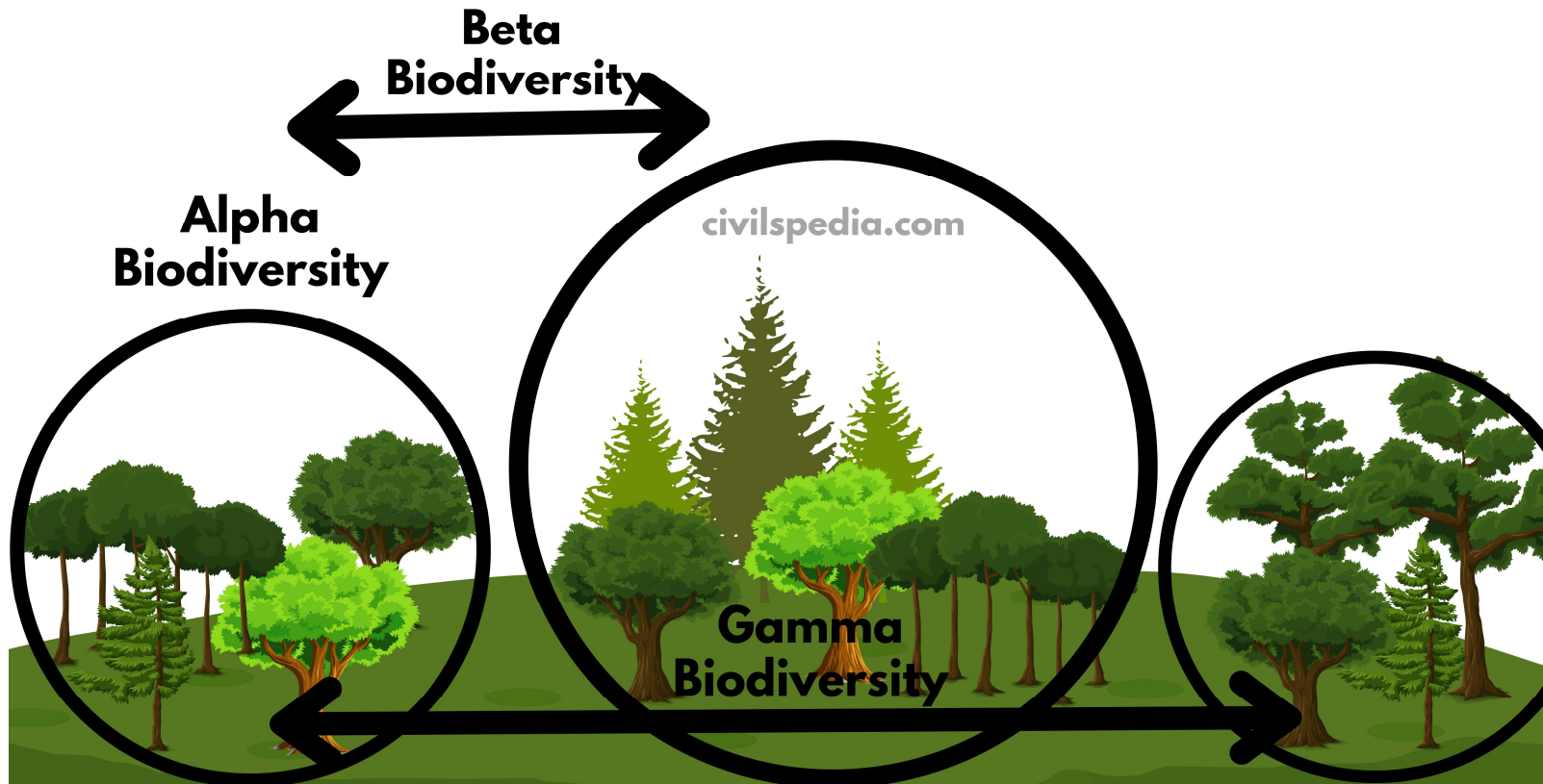
Cultural history shapes ecology



Trees as living archives

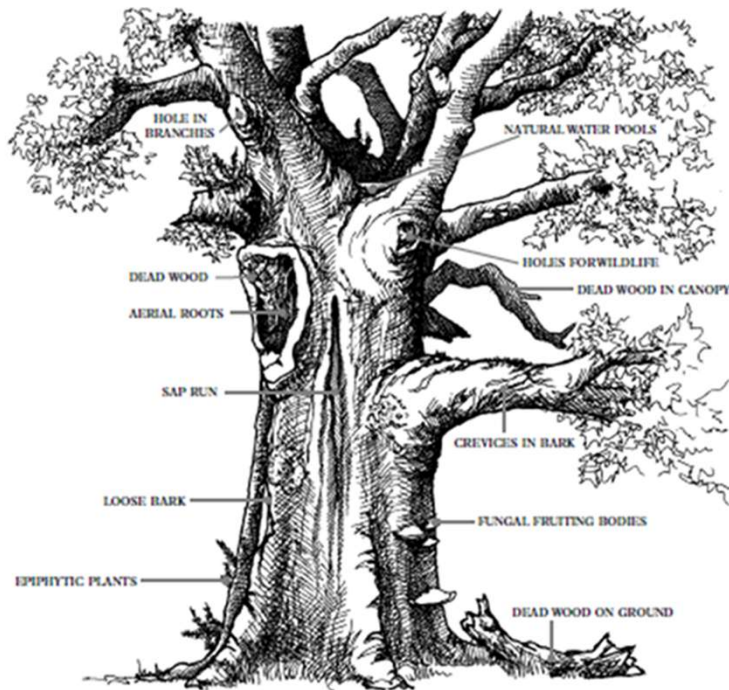


Biodiversity at multiple scales



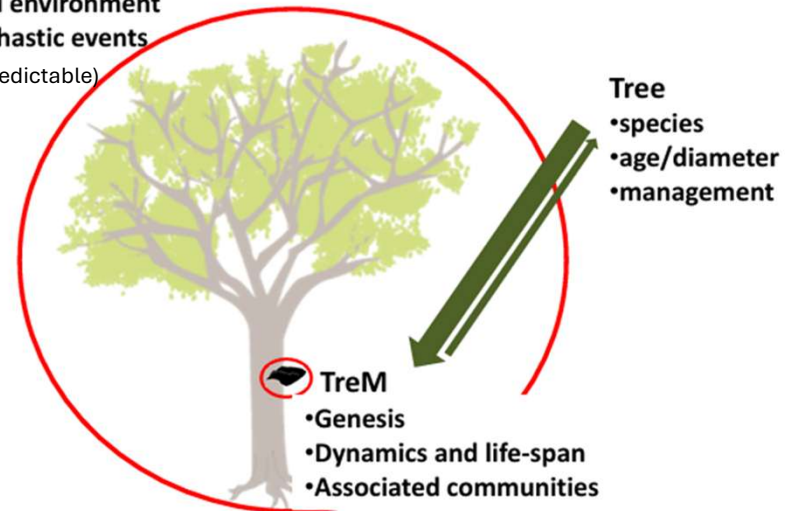
Why open-grown trees are biodiversity hotspots?

Diagram to show the features characteristic of a veteran tree.



TreMs depend on tree features...

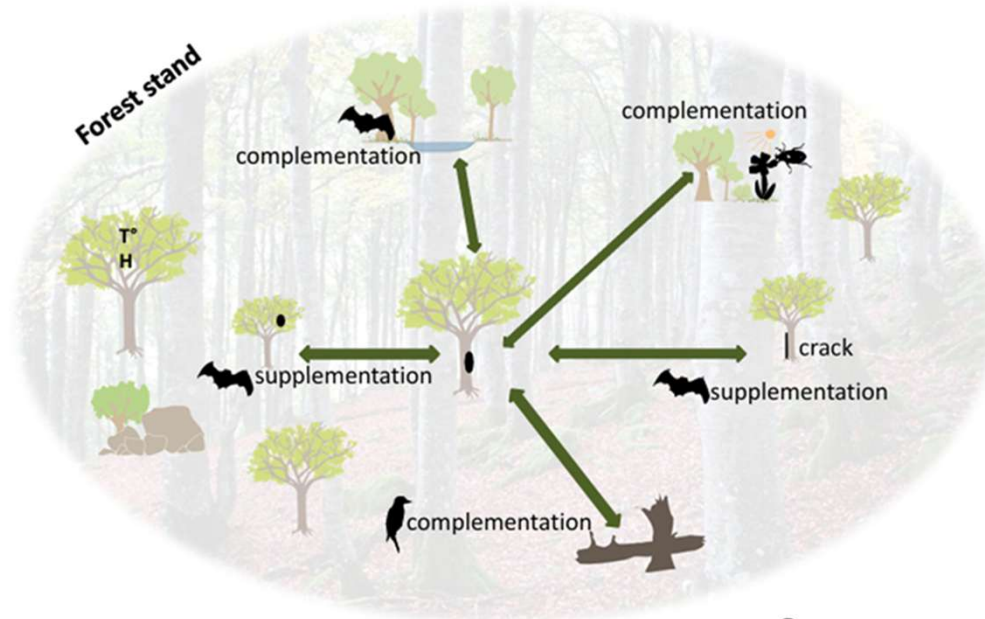
- local environment
- stochastic events
(unpredictable)



... and the health and life-span of habitat-tree sometimes depend on the TreMs it bears

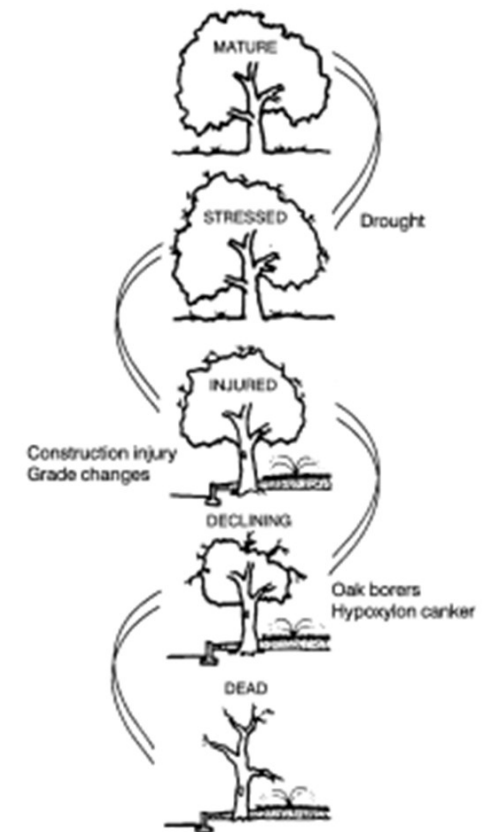
Dynamic tree ecology

TreMs take part in a complex functional habitat network



Examples of complementation/supplementation resources for woodpeckers (), bats ()
saproxylic beetles ()

Larrieu 2014



Traditional management as ecology





Ecological rating of TreMs and habitat trees

Two approaches to assigning a score to a habitat tree

Which species benefit
from my tree?



« Taxon-based »
approach

Biodiversity Score

VS.

How does my
management affect the
overall hosting potential
of my tree/stand?



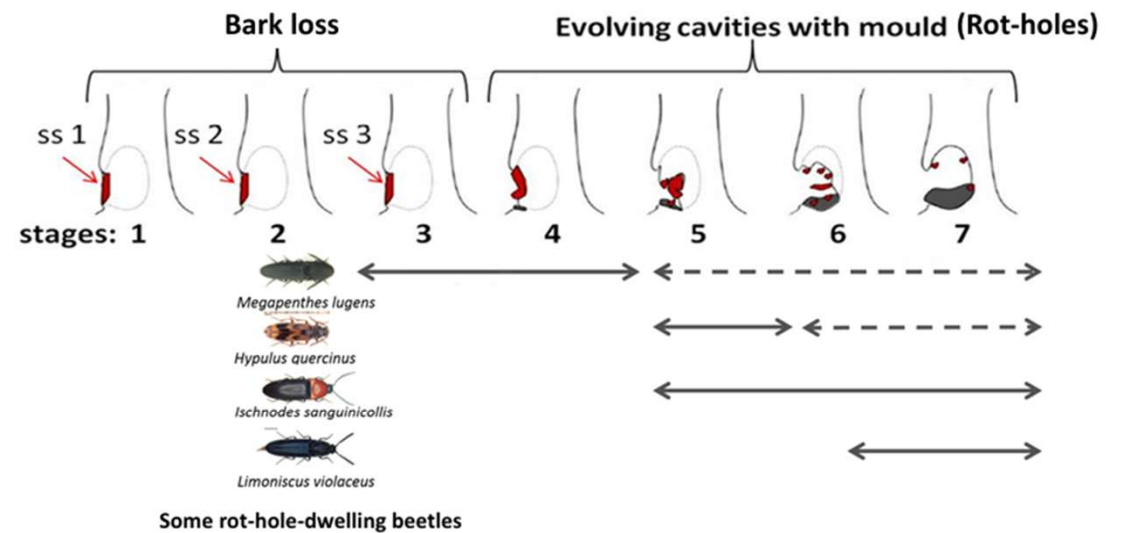
« Management-based »
approach

Management Score

Adapting methods for open-grown trees



The evolving stage of the TreM impacts on the associated communities



Management priorities



Management priorities



Retention first



Planned recruitment



Low intensity interventions



Medium-intensity stewardship

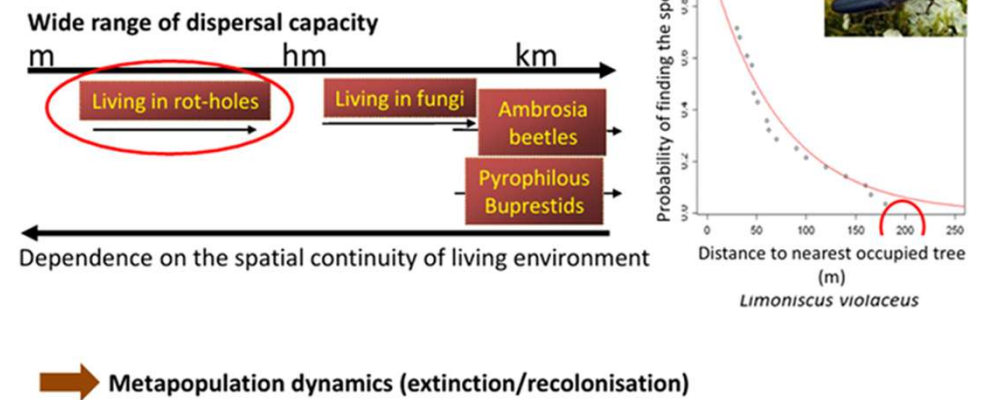


High-intensity stewardship?

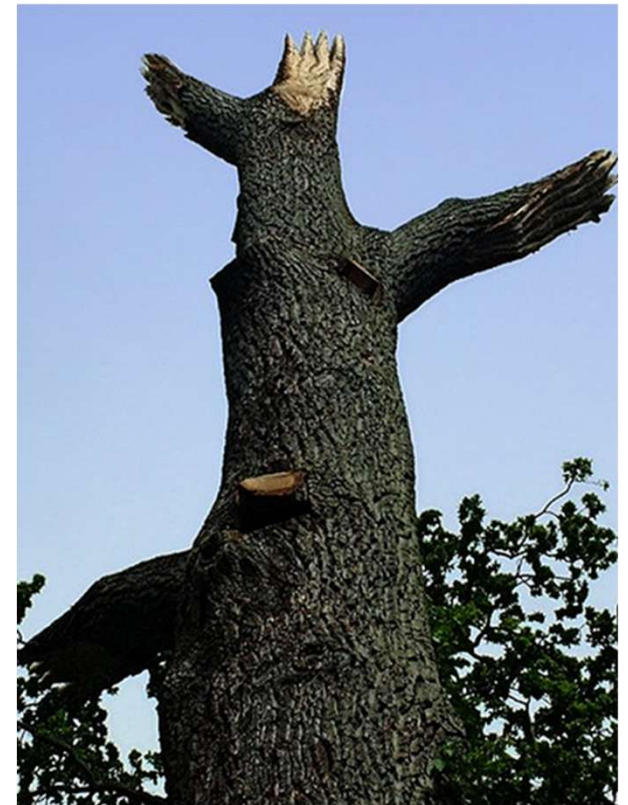


Some TreM-dwelling taxa have a very low dispersal capacity

Saproxylic beetles

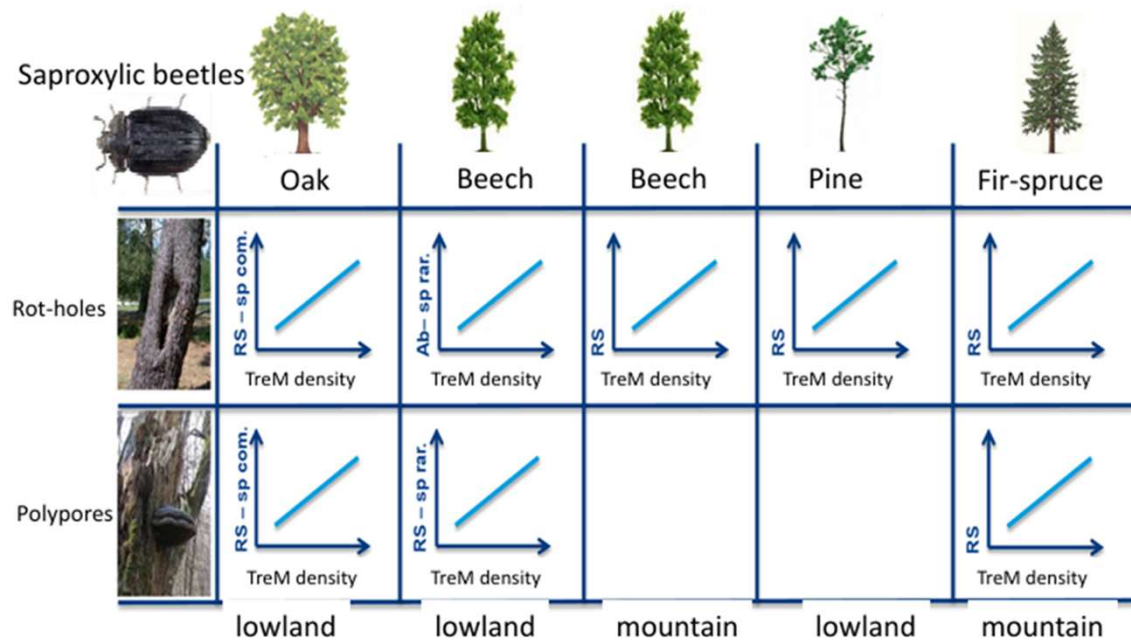


Learning from, not repeating the past mistakes!

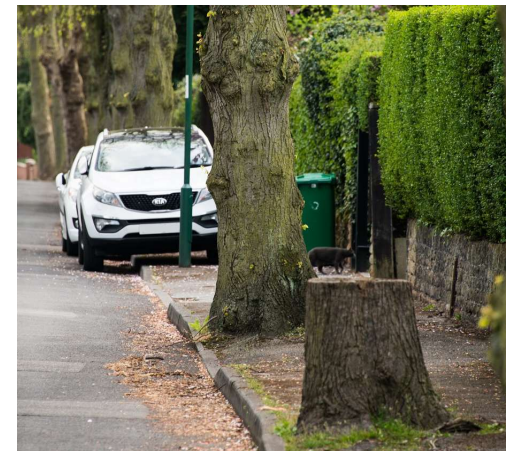


Monitoring: building an evidence base

At the stand scale, increasing TreM density always impacts biodiversity positively

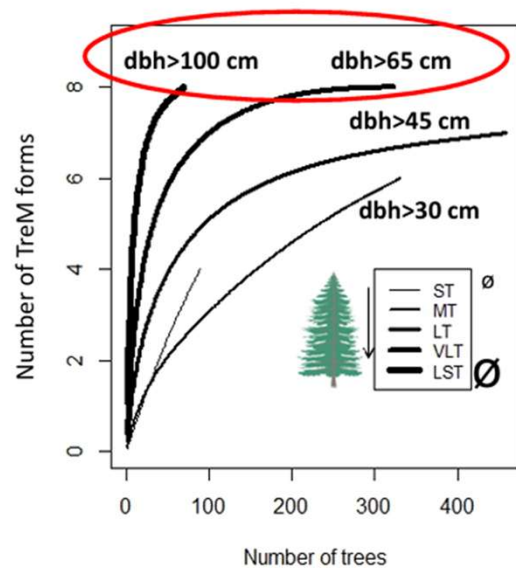


(Bouget et al. 2014)



Metrics that matter

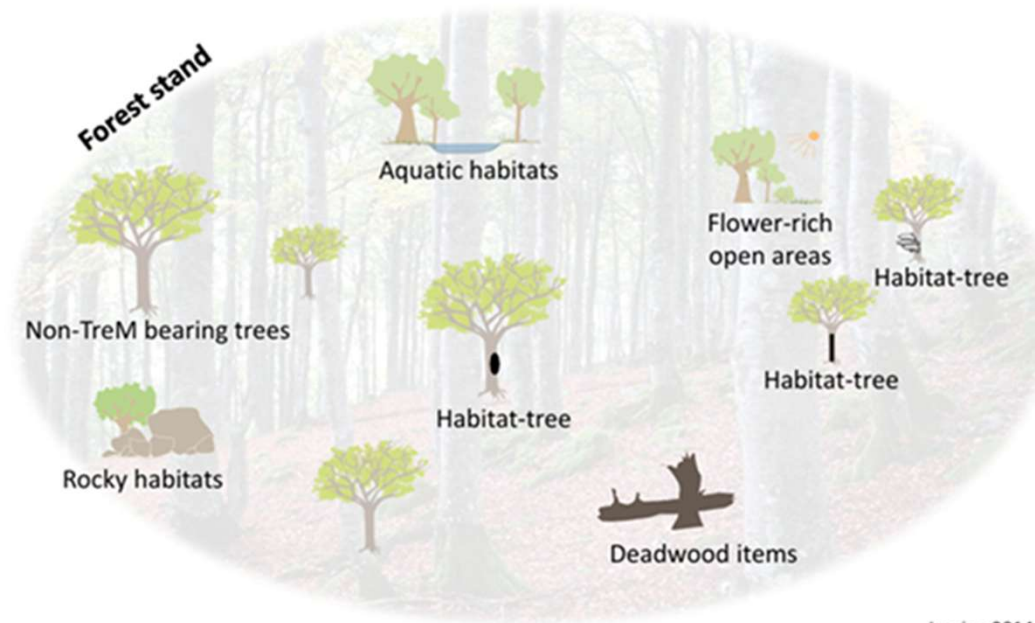
Only the largest trees bear all TreM types



(Larrieu et al. EJFR 2014)

Temporal monitoring

The TreM concept: an assemblage of ephemeral resources patches that are functionally linked to other surrounding key resources



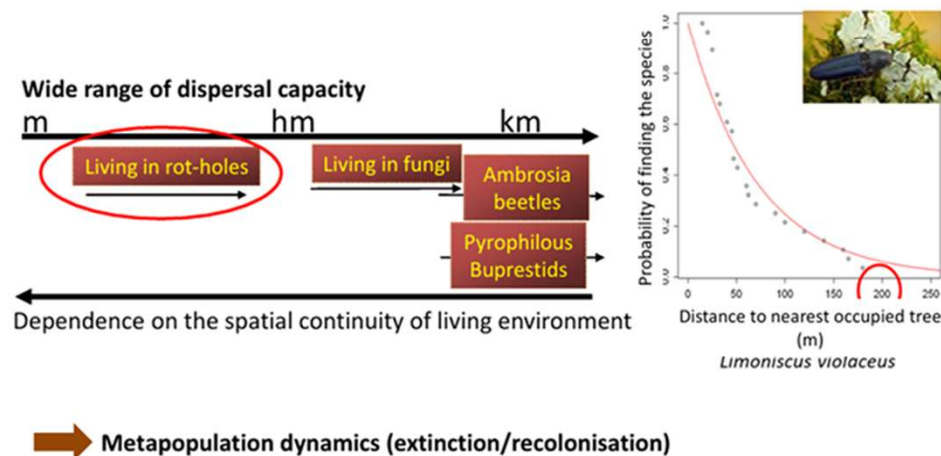
External drivers



Adaptive management

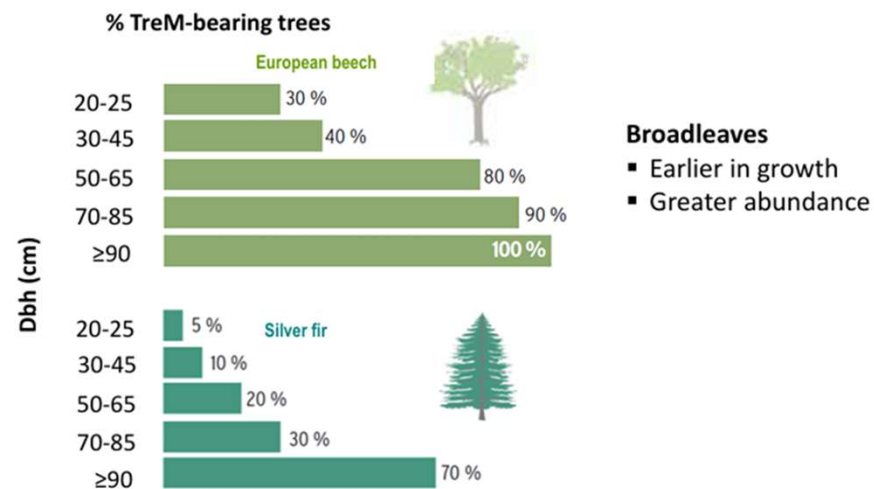
Some TreM-dwelling taxa have a very low dispersal capacity

Saproxyllic beetles



Tree species differ in TreM dynamics

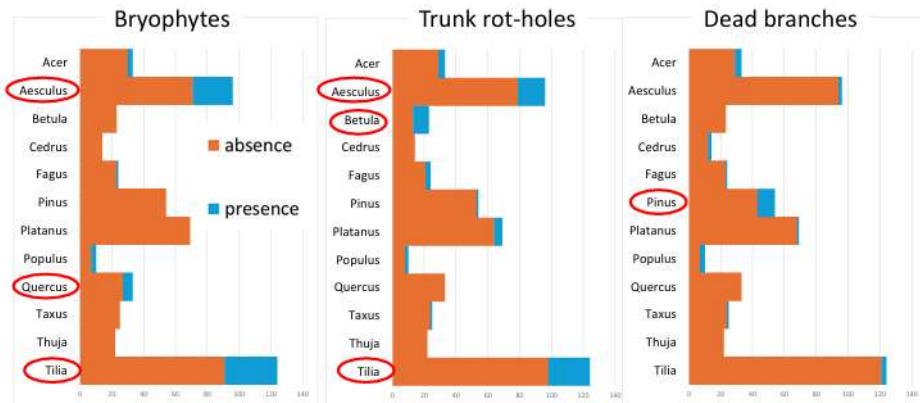
Broadleaves >> conifers



Research priorities

Some TreM types appear to be more prevalent in specific tree genera

Urban/park landscape



n = 635 urban trees (12 native and 19 alien tree genera)

Bütler et al., unpubl. data

Pruning cuts

new TreM type?



associated species?



Epicormic shoots



associated species?



Top of the limbs



Top of the trunk



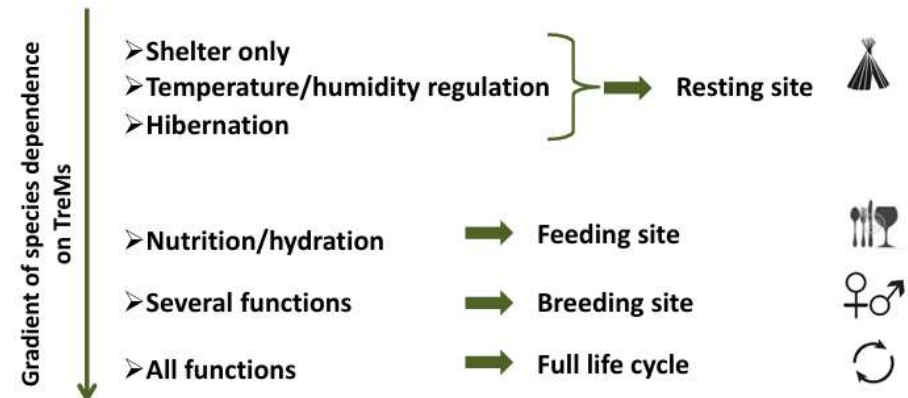
Trunk base → contact with soil

The arboriculturist as steward

➔ Some practical issues related to the conservation of TreM-dwelling species

- Need for a "flow" of habitat-trees to maintain the "stability" of the TreM resource
- Need for a TreM density that matches the life traits of the associated species
- Probable effect of the spatial distribution of habitat-trees on the dynamics of associated communities

TreMs play a wide range of pivotal biological roles





Take-home messages

- ✓ TreMs = key resources for **thousands of species**
- ✓ TreMs are **ephemeral** resource patches
=> need of **constant renewal of habitat trees** (temporal continuity)
- ✓ TreMs are **discrete** resources → **location** should take into account the **dispersal capacity of associated taxa**
- ✓ TreM concept is useful for management of trees in forests, **urban parks**, open landscapes, etc.
- ✓ **Use size thresholds** for TreM inventories => standardization
=> shared database
- ✓ **Training** is necessary => use our tools
- ✓ **Raising awareness** among tree managers
by disseminating the TreM concept



**Thank you for listening –
Kevin Frediani FARborA**

**With generous support of
TreMs slides by:**

Rita BÜTLER

1 Swiss Federal Institute for
Forest, Snow and Landscape
Research WSL

2 Swiss Federal Institute of
Technology, Lausanne EPFL

Laurent LARRIEU

3 French National Research
Institute for Agriculture, Food
and

Environment (INRAE)

4 National Center for Private
Forest Ownership (CNPF)

