Vlaanderen
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INSTITUUT
NATUUR- EN BOSONDERZOEK

Criteria to identify old-growth forest

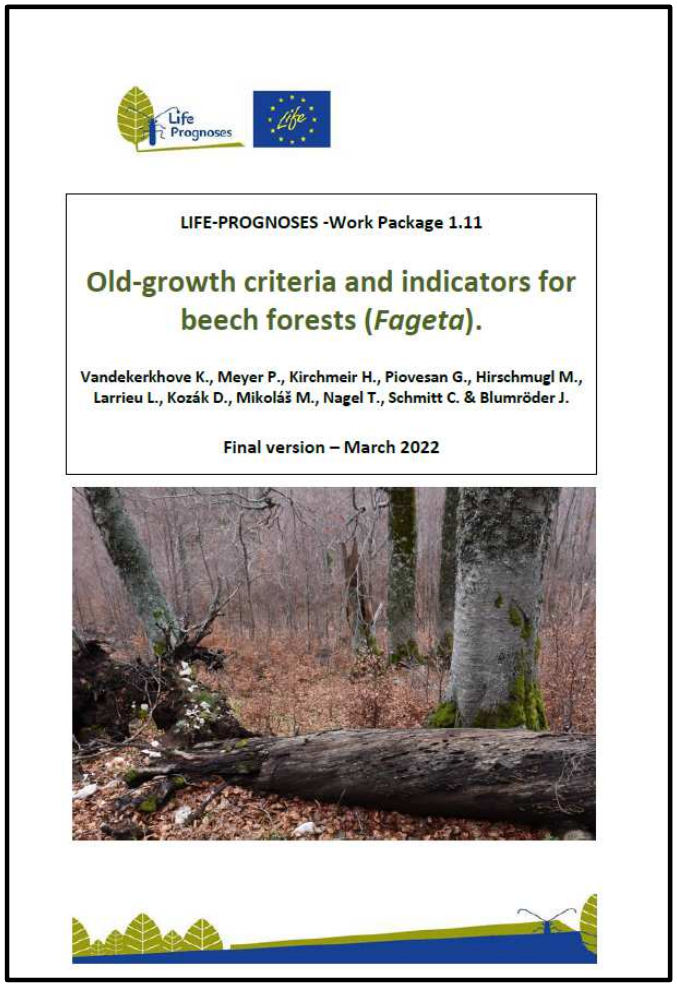
How to apply the EU-mapping guidelines:

an example for temperate oak and beech forests

Kris Vandekerkhove - INBO

Conference *'Old-growth forests in the context of climate policy: what is and what is not an old-growth forest?'*
October 12th, 2023 – Riga + online

LIFE - PROGNOSES



Report

- Literature review
- Definitions Primary and OGF
- Criteria and indicators of OGF applied to beech forests

download at:

www.lifeprognoses.eu/outputs-of-the-project/

Primary vs. Old-Growth

Primary (FAO) = "*Naturally regenerated forest of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.*"

- Explanatory notes (FAO)
- 1. This definition includes both pristine and [*formerly*] managed forests that meet the definition.
- 2. This definition includes forests where indigenous peoples engage in traditional forest stewardship activities that meet the definition.
- 3. This definition includes forests with visible signs of abiotic damage (e.g. storms, snow, droughts and fires) and biotic damage (e.g. from insects, pests and diseases).

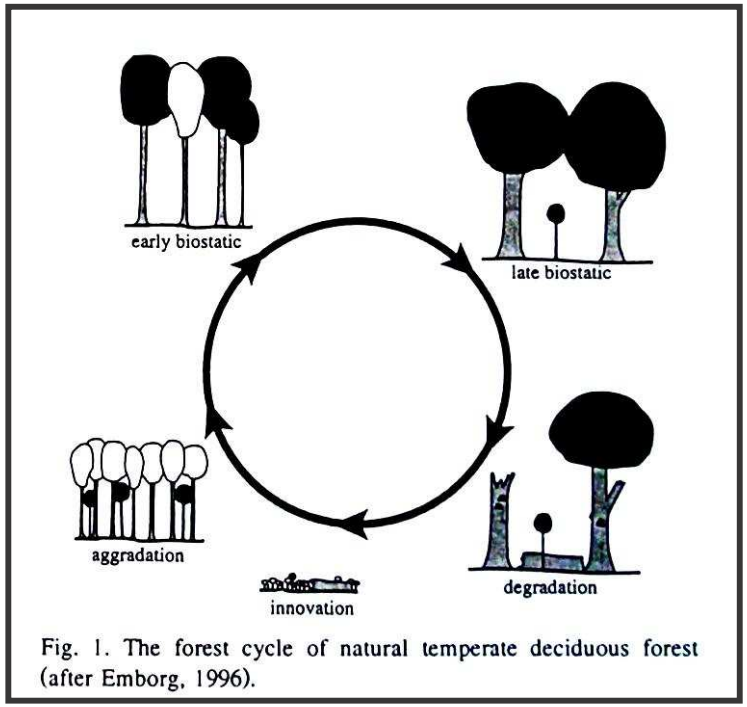
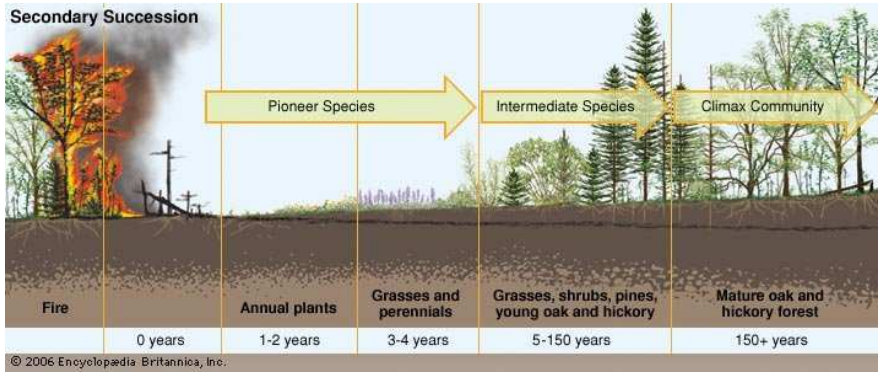
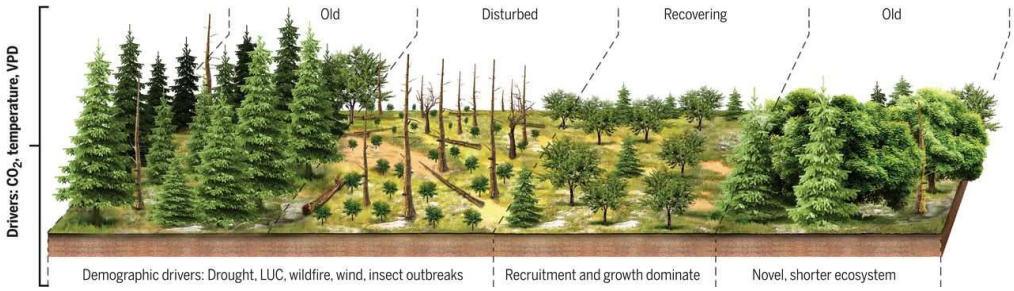


Fig. 1. The forest cycle of natural temperate deciduous forest (after Emborg, 1996).





EU-DG-Envir. (2023) Guidelines for defining, mapping, monitoring and strict protection of EU Primary and Oldgrowth forests

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- 4. This definition excludes forests where hunting, poaching, trapping or gathering have caused the loss of significant native species or disturbance to ecological processes.

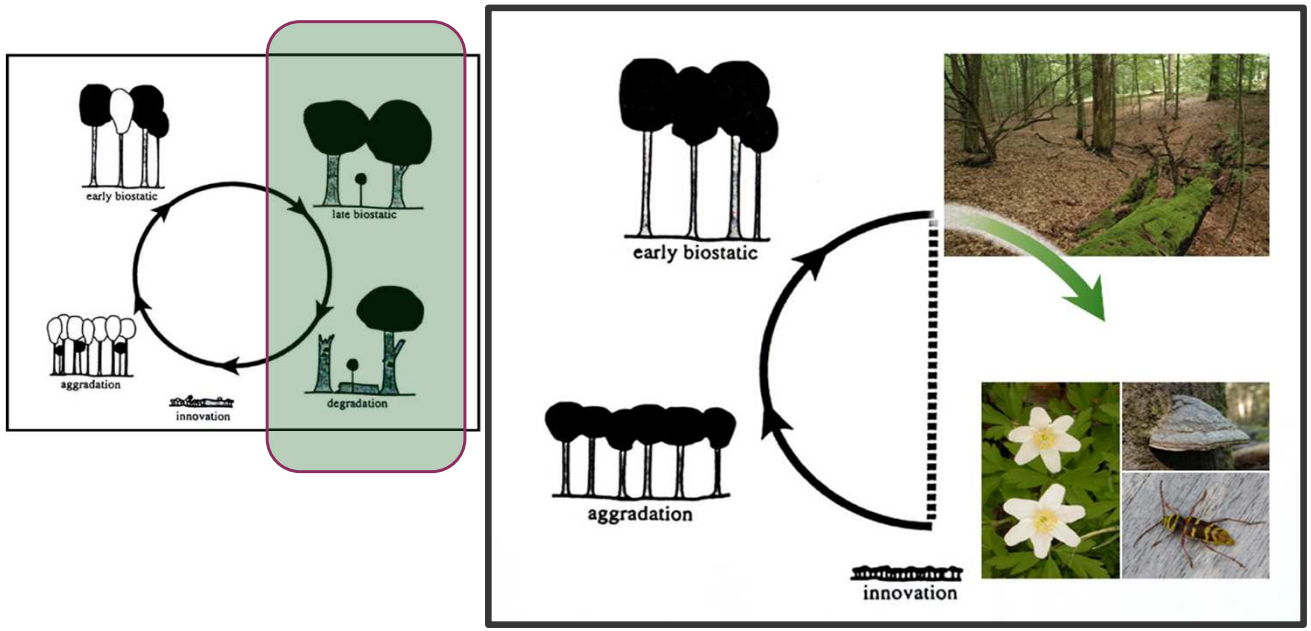
- **EU (2023): Primary forests have a number of key characteristics:**
- they show natural forest dynamics, such as natural tree species composition, occurrence of dead wood, natural age structure and natural regeneration processes;
- the area is large enough to maintain its natural ecological processes;
- there has been no known significant human intervention, or the last significant human intervention was **sufficiently long ago** to have allowed the natural species composition and processes to re-establish themselves.

Buchwald (2005) and ***Sabatini et al (2018,2020, 2021):*** *always or at least for the past 60 to 80 years been essentially unmodified by human activity*

EU-DG-Envir. (2023) Guidelines for defining, mapping, monitoring and strict protection of EU Primary and Oldgrowth forests

Primary vs. Old-Growth

Old-Growth (EU 2023) *= : "A forest stand or area consisting of native tree species that have developed, predominantly through natural processes, structures and dynamics normally associated with late-seral developmental phases in primary or undisturbed forests of the same type. Signs of former human activities may be visible, but they are gradually disappearing or too limited to significantly disturb natural processes'.*



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- This definition includes forest stands that originate not only from natural regeneration, but **also from planted or sown native tree species** (provided that they meet the rest of the definition).
- 2. This definition includes forest stands where indigenous peoples engage in traditional forest stewardship activities that otherwise meet the definition.
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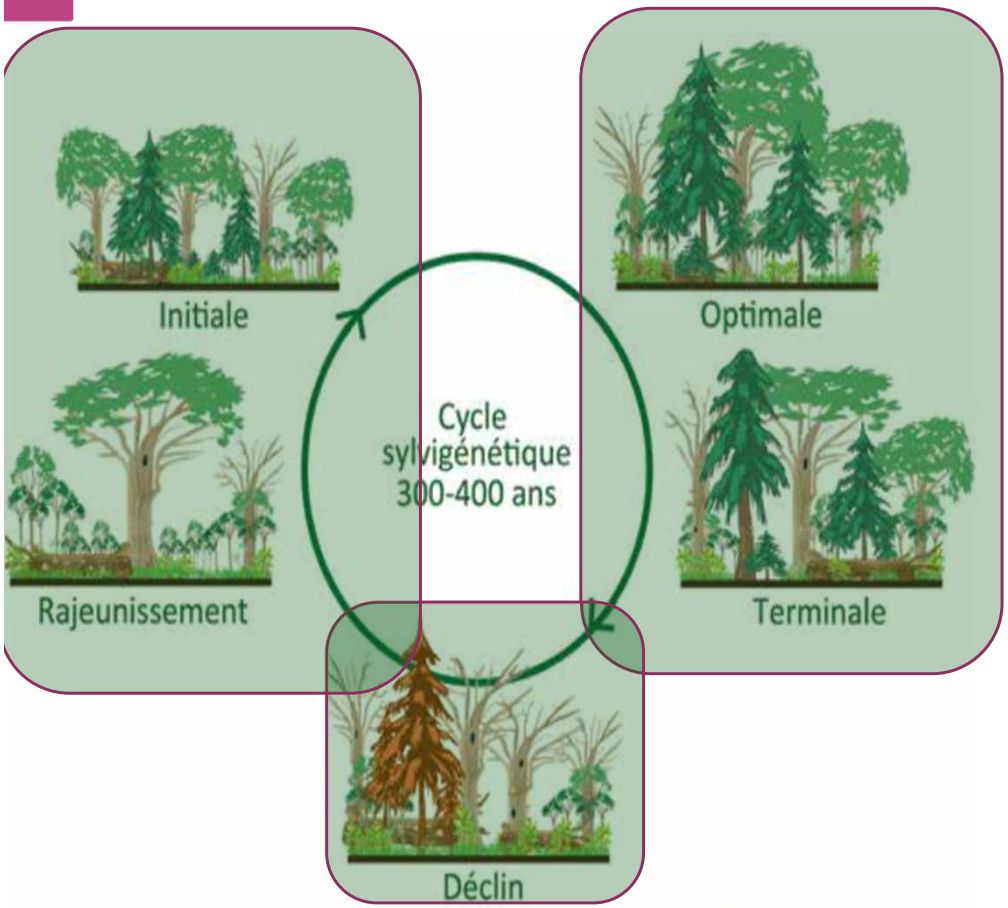

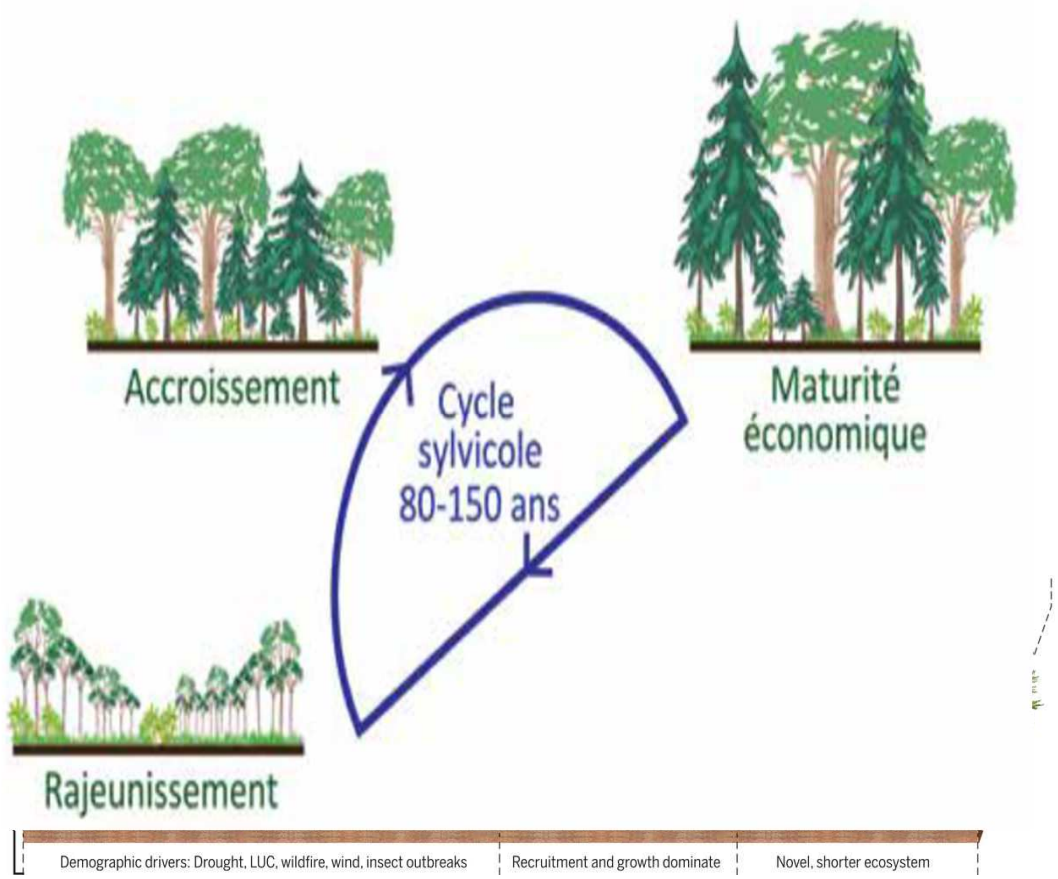

Primary vs. Old-Growth

Old-Growth (EU) – explanatory notes

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- This definition includes forest stands with visible signs of abiotic damages (e.g. storms, snow, droughts and fires) and biotic damage (e.g. from insects and diseases) that meet the definition
- **Forests with visible signs of past human activity are not excluded** from the definition of old-growth forests, unless the magnitude of the impact of the activity is such as to prevent the forest stand from counting as old-growth (see Section 3.2).
- Oldgrowth forest stands **do not include stands** for which there is evidence that they are **under active productive management**. This includes low-intensity silvicultural regimes and coppicing.
- **Some key characteristics of old-growth forest stands are:**
- they contain structural features and dynamics such as natural regeneration, gap dynamics, large and diverse **dead wood**, **structural complexity**, and the presence of **old trees**, or trees reaching senescent stage and tree-related **microhabitats**.
- they have acquired these structural features and dynamics through **several decades of natural development** **without significant human intervention**.

EU-DG-Envir. (2023) Guidelines for defining, mapping, monitoring and strict protection of EU Primary and Oldgrowth forests

Level of ‘old-growthness’

Old-Gr

?

0 – 20c

Stand initiation

a Peneva

Indicators of Old-Growthness (OGI's)

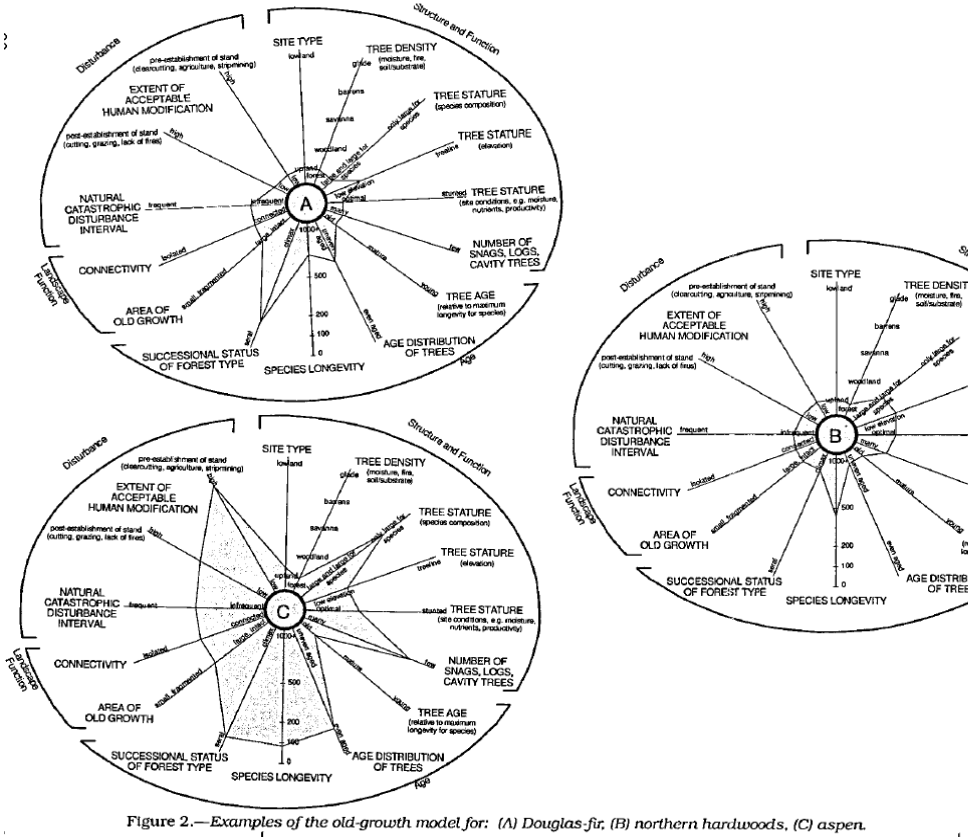
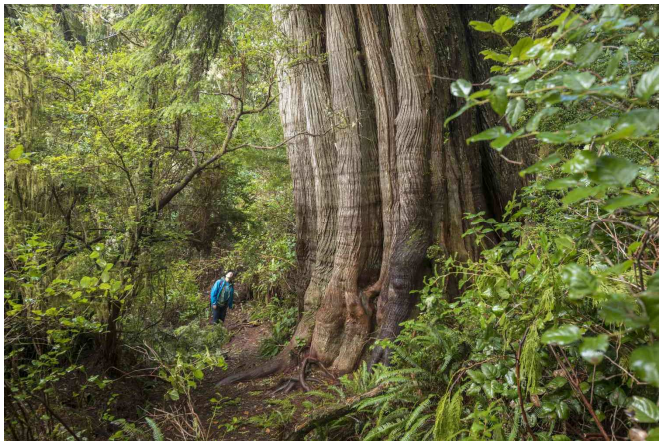


Figure 2.—*Examples of the old-growth model for: (A) Douglas-fir, (B) northern hardwoods, (C) aspen.*

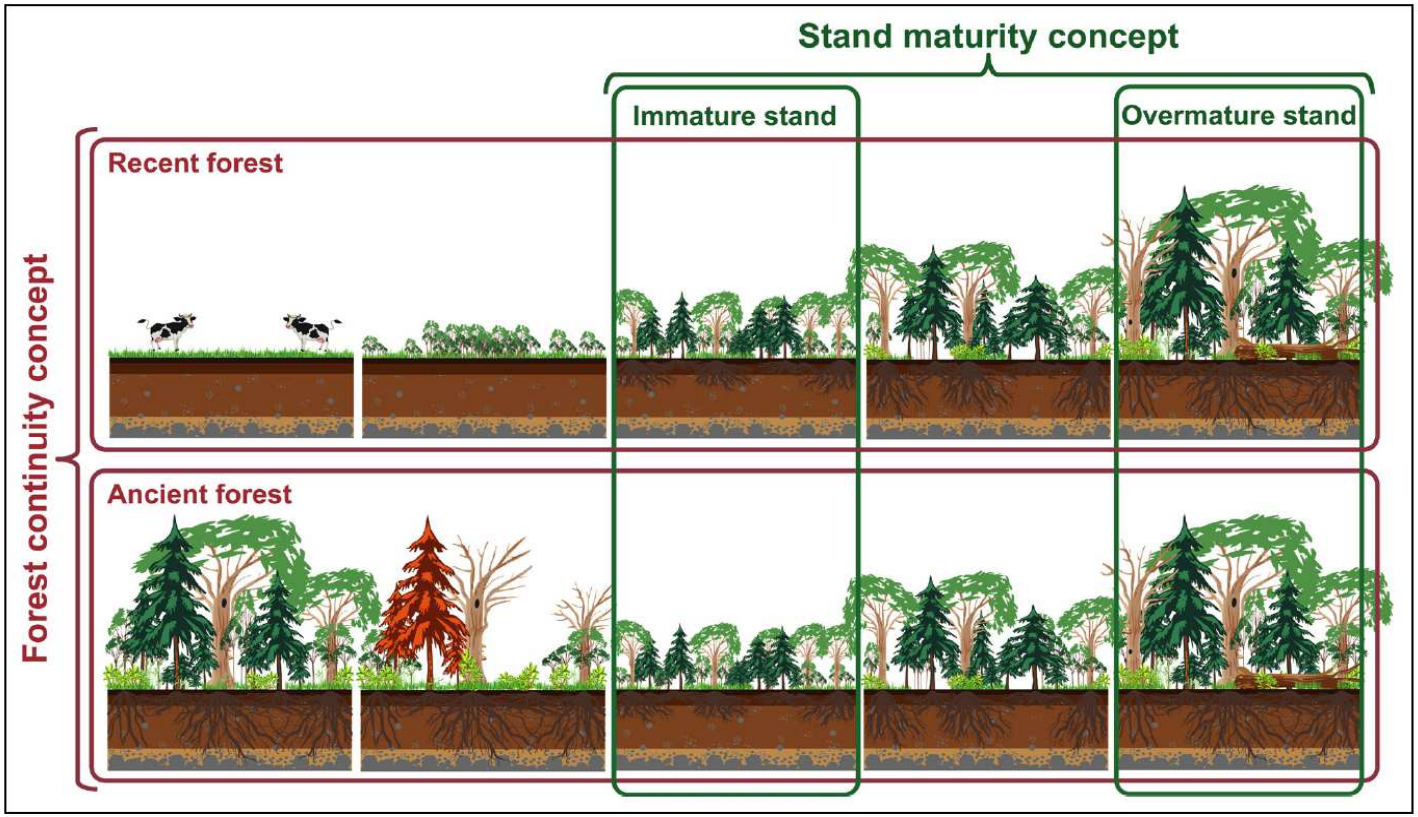


Tyrell et al. 1998 - USDA General Technical Report NC-197

Indicators of Old-Growthness (OGI's)

- Tree species composition (Native)
- Dead wood quantity & quality
- Large/old trees
- Structural complexity: age, tree size, biomass distribution, layering, gaps,…)
- Microhabitats :
  - Tree related microhabitats
  - Soil microstructures (pits and mounds)
- Presence of indicator species

Oldgrowth vs. ‘ancient woodland’



Janssen et al. 2019 – FEE.2087

Figure 1. Depiction of the difference between forest continuity and stand maturity.

- Ancient = land use continuity
- Oldgrowth = continuity of OG Features

trees >150y old => forest continuity >150y

Mapping exerci for Old Growth forest in Flanders (BE)

CONTEXT

- Low forest cover (11

- Low forest contin
century

- Long history c
12th
20

- First initi s

- Reliable basic info :
Ancient Forest map + Forest 2000)
also: Forest Inventory (VBI) SFR

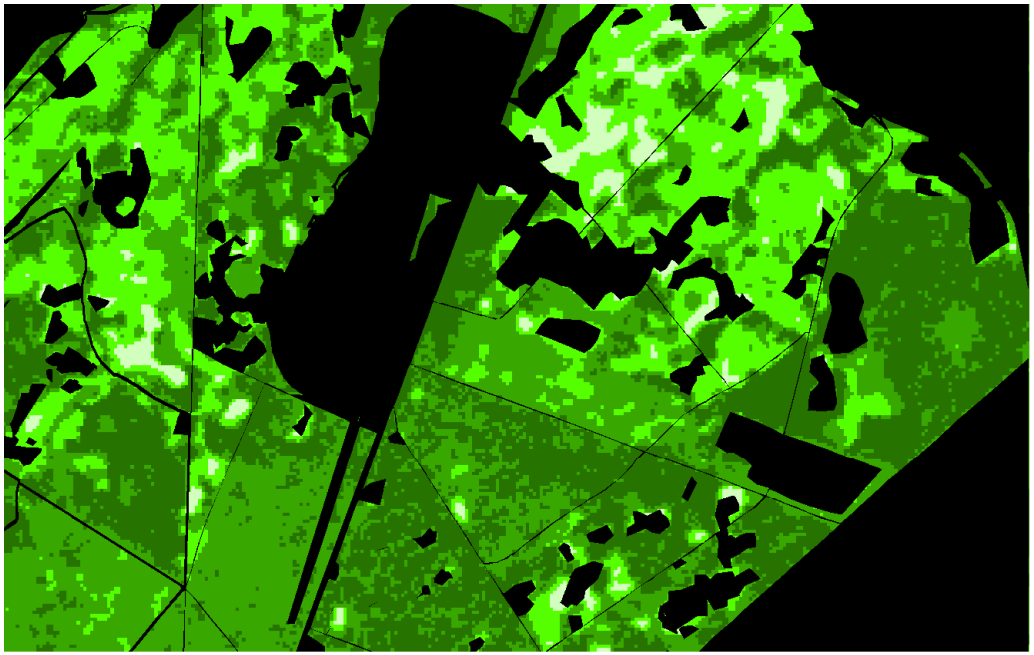
Approach : 3 stage-rocket

Phase 1 : Old and uneven-aged stands dominated by native species

(Forest Ref. map) AND Forest Continuity >150y

- Total forest area : **140.000 ha**

- area Phase 1 : **19.000 ha** = 13,5 % of forested land
- Broadleaved and mixed : **17.250** ha;
- old pine stands (>80y) : **1.900** ha



500 Meters

Classification based on Sentinel-2 satellite time series imagery and ALS data

Life Prognoses

Life

Phase 2 : 'several decades of natural development'

- PROPOSAL : 25 years of set-aside or minimal intervention *(2x maximum intervention cycle in regularly managed forest)*

- Network of strict forest reserves : °1995-2000
- Forest Nature reserves with 25y non-intervention (scarce)
- Other 'abandoned' stands

- Minimum area : 1 ha (small management unit – 'stand')
  → Smaller = set-aside island in the context of managed forests

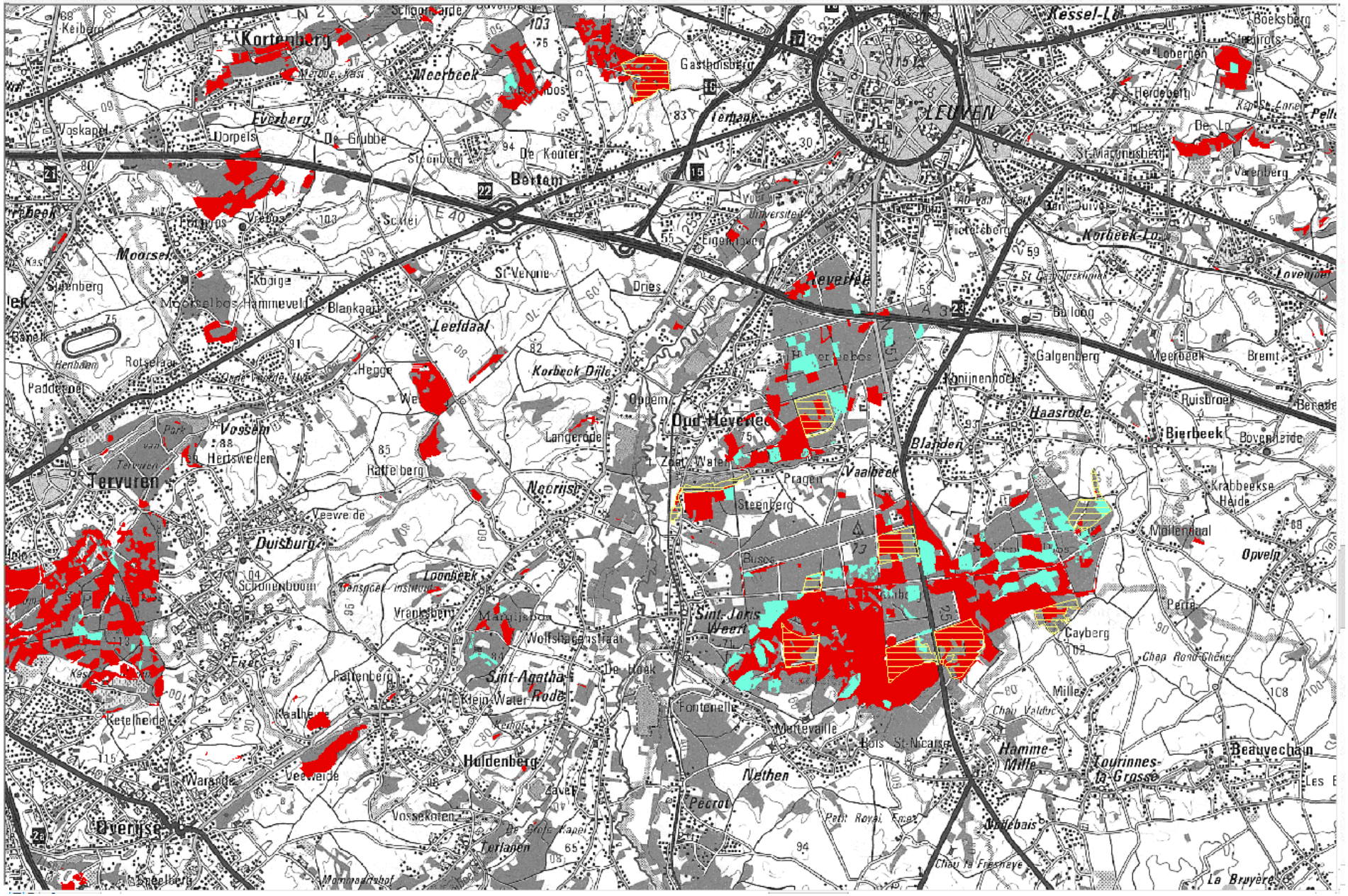
Area covered : estimated at **2000-3000 ha** (1,5-2% of forest area)
(Phase 1 + reserve = 1400 ha Broadleaved + 200 ha Pine)

Potential for extension '*oldgrowth of the future*' : see Phase 1

- Field assessment in case of doubt

Phase 1 +2 : Old and uneven-aged stands dominated by native species

(Forest Ref. map) AND Forest Continuity >150y AND reserve



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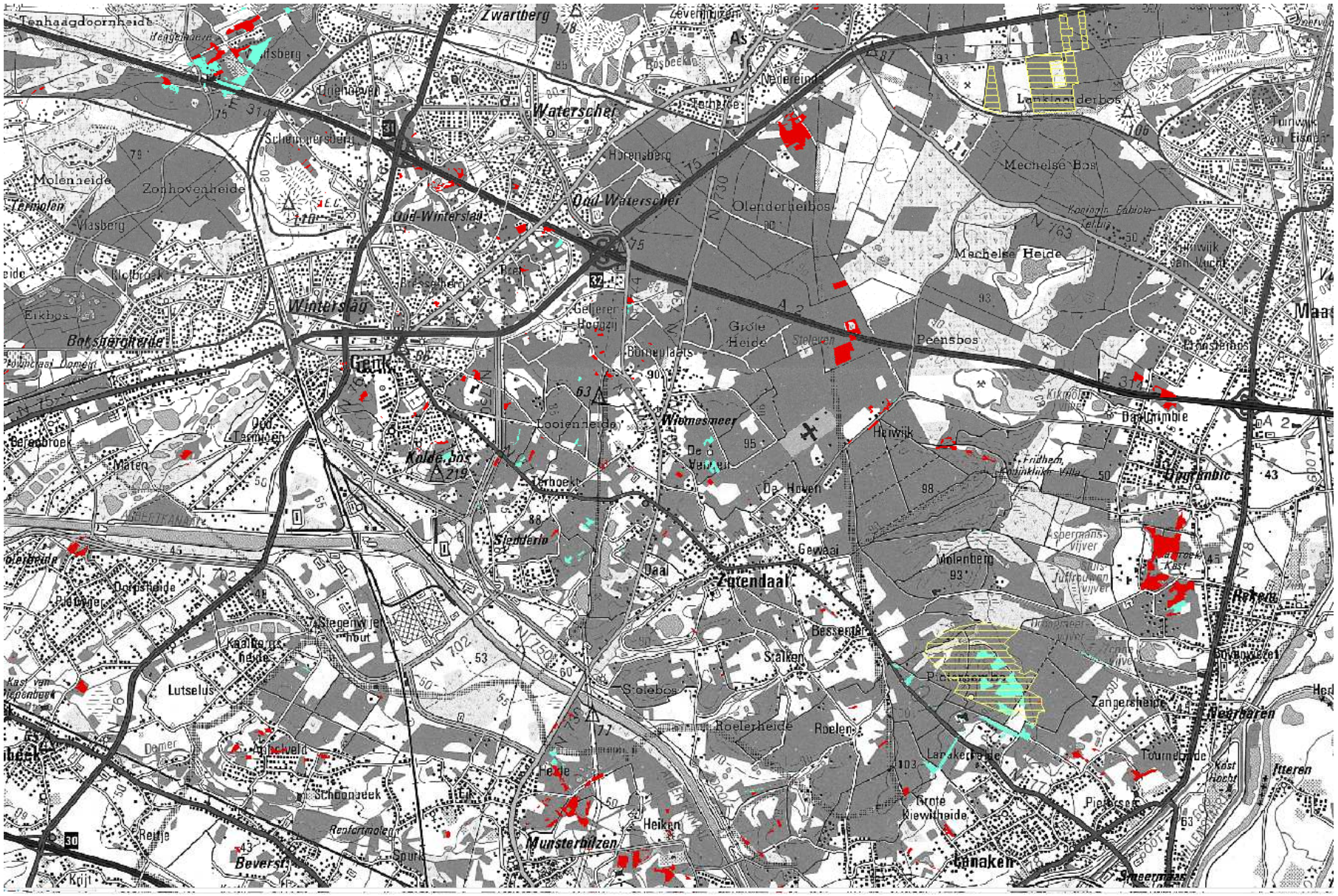


Benchmark/Threshold values for beech and oak forests

Significant presence of Large/old trees

Treshold size/age :
>1/2 of natural population lifespan : > 150 y old (beech); 200 y (oak)
Size : site dependent

High productive sites (canopy height >30m): 80 cm DBH
Medium productive (canopy height 20-30m): 70 cm DBH
Low productive (canopy height < 20m): 60 cm DBH

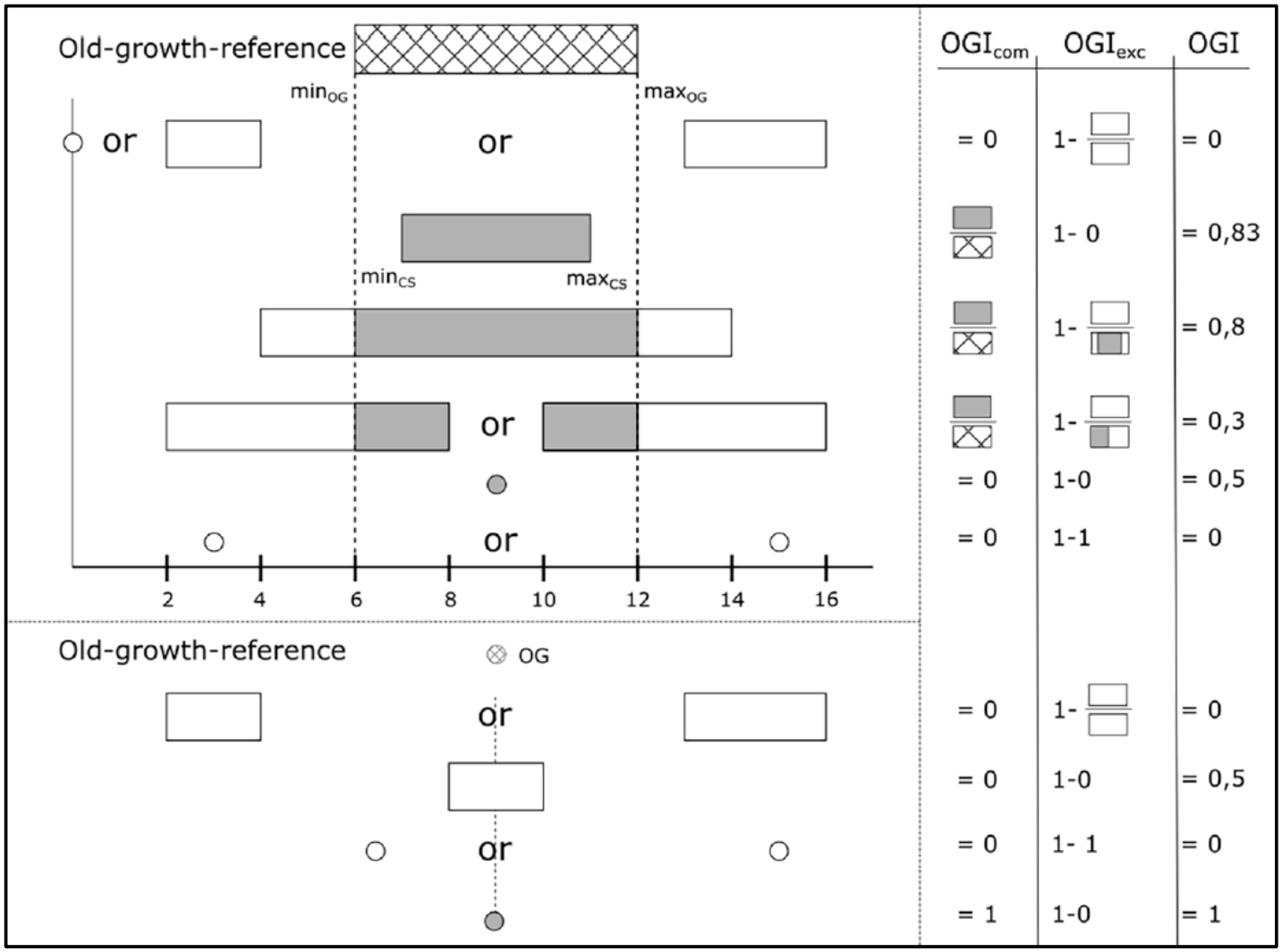
Benchmark values from most 'natural' reference sites :

5-10 VLT/ha

- Threshold : 1-2/ha
- OR Scoring: *'distance to target'*

Vandekerkhove et al. 2011 Silva Fennica
Vandekerkhove et al. 2018 Forest Ecology & Management

Benchmark/Threshold values for beech and oak forests



Meyer et al. (2021) Ecol. Indic.

Benchmark/Threshold values for beech and oak forests

Deadwood volume and decay-stages

Benchmark values : 50-200 m^3/ha with ¾ volume = CWD; all decay stages well represented

Treshold amount: after 25 years of non-intervention and no stand-replacing disturbances (background mortality) :

Productive sites : 30-40 m^3/ha

Medium productive sites : 20-30 m^3/ha

Low-productive sites : 15-20 m^3/ha

Presence of large snags and logs (CWD)

Threshold DBH : 40/35/30 cm : at least 1 within 20m of plot center

Decay stages : at least 1-3 (medium decayed wood – sapwood decaying, bark = loose or missing)

Vandekerkhove et al. 2009 Forest Ecology & Management

Benchmark/Threshold values for beech and oak forests

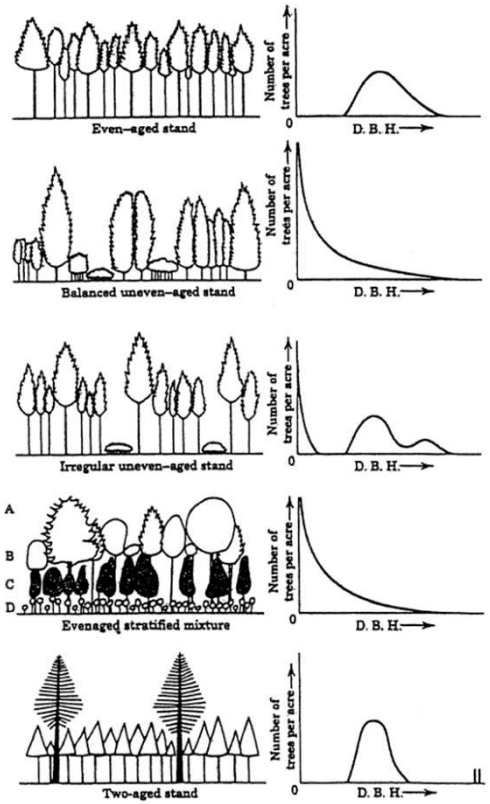
Structural complexity

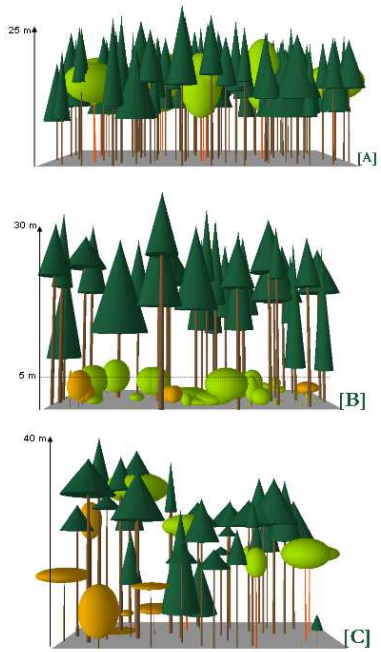
- Tree species diversity: reference ?
- DBH-diversity : Reference : Inverse J-curve (?)

  Inter Quartile Range in DBH ?
- Layering : multi-storey forest (but Beech forests ?)

Not very clear, thus not very strict criteria

- >50% of the volume is stocked in LT & VLT (DBH >30/35/40 cm)





Benchmark/Threshold values for oak and beech forests

Presence of tree microhabitats












Benchmark/Threshold values for oak and beech forests

Presence of tree microhabitats

- Diversity
- Density of TREM

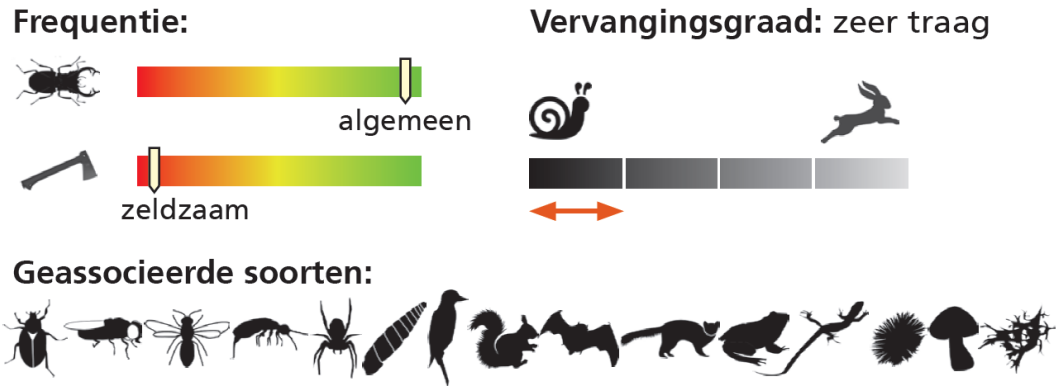
- Scoring : ‘distance to target value/reference range’
- Harvest induced bark damage :

Benchmark/Threshold values for oak and beech forests

Presence of tree microhabitats

- Diversity
- Density of TREM

- Specific types that are more typical for OGF

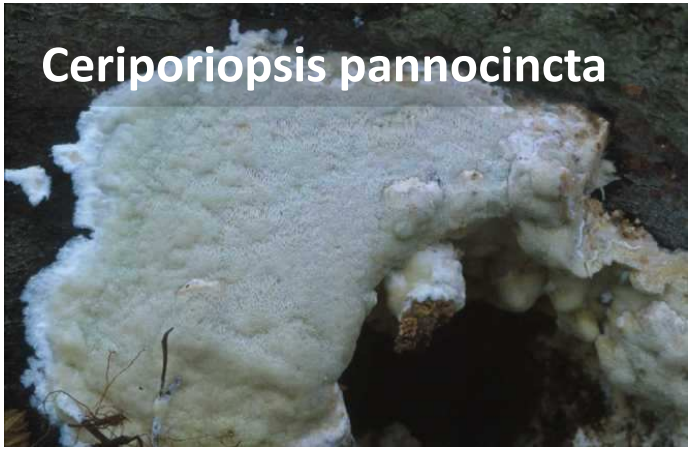


Larrieu et al. 2018 Ecol. Indic
Bütler et al. 2020 Field Guide to tree related microhabitats

Benchmark/Threshold values for beech and oak forests

Indicator species

Fungi : e.g. **Christensen et al. 2005**



Benchmark/Threshold values for beech and oak forests

Indicator species

Fungi
Invertebrates (beetles, hoverflies, …)
No systematic data

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