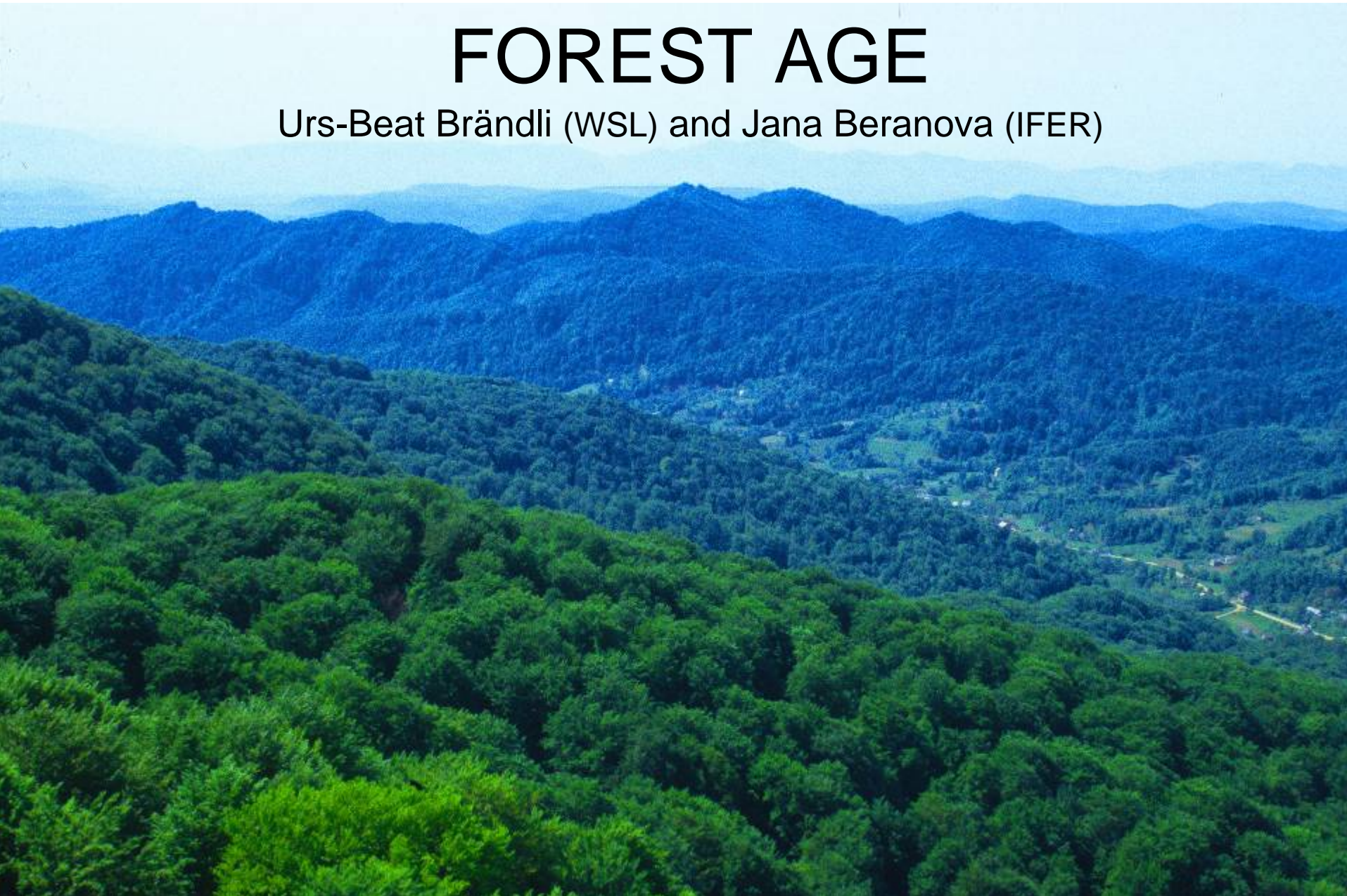


COST Action E43

Harmonisation of National Inventories in Europe: Techniques for Common Reporting
Working Group 3 – contribution of field data acquired in NFI for forest biodiversity assessment

FOREST AGE

Urs-Beat Brändli (WSL) and Jana Beranova (IFER)





The age of trees or stands is an important component of forest ecosystems.

It can be an indicator for biodiversity because large and old trees are important habitats of typical forest animals (black stork, [e.g. black] woodpeckers, bats, insects, ...), lichens, fungi and mosses.

Especially epiphytic, saprophytic and saproxylic species that grow or spread slowly or follow each other in a succession (on the same tree) depend on old trees

and stands.

<i>Country name</i>	<i>Abbreviation</i>	<i>Tree age</i>	<i>Stand age</i>
Austria	AT	X	X
Belgium	BE	X	X
Cyprus	CY		
Czech Republic	CZ	X	can be calculated
Denmark	DK	X	X
Estonia	EE	X	X
Finland	FI	X	X
France	FR	X	can be calculated
Germany	DE	X	can be calculated
Greece	GR		
Hungary	HU		X
Ireland	IE	X	can be calculated
Italy	IT	X	X
Lithuania	LT	X	X
Norway	NO	X	X
Portugal	PT	X	X
Romania	RO	X	X
Slovakia	SK	X	X
Slovenia	SI	X	X
Spain	ES	X	X
Sweden	SE	X	X
Switzerland	CH		X
United Kingdom	UK		X



Over 90% of the European countries assess forest age (tree and/or stand). That indicates the importance of this variable and a good assumption in general to introduce and harmonise stand age as a biodiversity-related indicator.

Tree age assessment

Two methods that can be accomplished for tree age assessment:

- (1) tree rings analysis
- (2) estimation

Tree rings analysis

All countries excluding Portugal and Slovenia have experience in tree ring analysis for tree age assessment in NFI. This method is rarely used in some of them (e.g. Ireland, DE)

Estimation

Different methods of estimation are used for tree age assessment:

- counting of annual shoots/branch/whorls
- local interview
- visual assessment
- counting of annual rings on recent stumps
- forest management records

Above mention procedures are used in AT, CZ, DE, EE, FI, FR, DK, IR, NO, P, SK, SLO



Assessment and interpretation (use) of tree age

Tree age assessment is done for sample trees representing all trees growing in the sample plot in Austria, Czech Republic, Germany, Denmark, Ireland, Lithuania, Norway, Portugal, Slovakia, and Sweden (50% of countries).

The data are used for deriving of height increment and volume function in Sweden, Germany, Finland and Denmark.

Czech, Slovak and Austrian NFI provide information about age class distribution and volume distribution.

Belgium, Estonia, Lithuania, Romania, Slovenia, Spain and Portugal assess tree age for sample trees because of estimation of stand age.

Czech Republic, Germany, France and Ireland could use tree age data for stand age assessment.



COUNTRY	DEFINITION
AT	Stand age is estimated based on the total ground coverage estimation.
BE	The stand age corresponds to the time comprised between the planting and the inventory in the field and does not include the age of young plants at planting moment.
DK	Age of trees making up 80% of the standing living volume.
EE	The stand age is the age of the stand element (dominant tree species) that has the biggest volume in plot.
FI	The age of growing stock is the sum of age at breast height and the age of reaching the breast height. The age of the dominant tree storey (layer) must be measured, for other storeys subjective estimation can be applied.
FR	Mean age of the upper ("dominant") tree storey of the stand with trees more than 7.5 cm in DBH. The "dominant" tree storey is above 2/3 of the dominant height (dominant height = average height of the 100 biggest trees in a circular plot of 25 m radius).
DE	The mean of the tree ages ≥ 7 cm dbh.
HU	The age of the dominant tree species is used as stand age.
IT	The average age of the main stand at 1,3m level.
LT	Stand age is age of main tree species of I storey.
NO	Age of dominating layer.
PT	No answer.
RO	Stand age is the mean age of the stand's element(s) which is (are) considered the most important concerning the management objectives.
SK	Age is assessed as stand story age (tree layer age). Stand age is calculated as weighted mean of stand story age.
SI	Stand age is defined as an average age of dominant trees (upper layer trees).
ES	Plantation year, in coppice forest: difference between year of cut and the actual year, number of rings at the minimum possible height
SE	The average stand age is given as total age; i.e, years from germination to year of estimation. At forest land over-storey trees, seed trees, undergrowth and dead trees are not considered. If the stand height is 7 meters or higher, the age is determined as basal area weighted average age. In less high stands the age is determined as arithmetic average age. In multi-aged stands the average age is estimated for the layer used to decide cutting class.
CH	Average (biological) age of the main stand.
UK	Planting year for plantations; otherwise estimate of tree age according to most common aged trees (median).

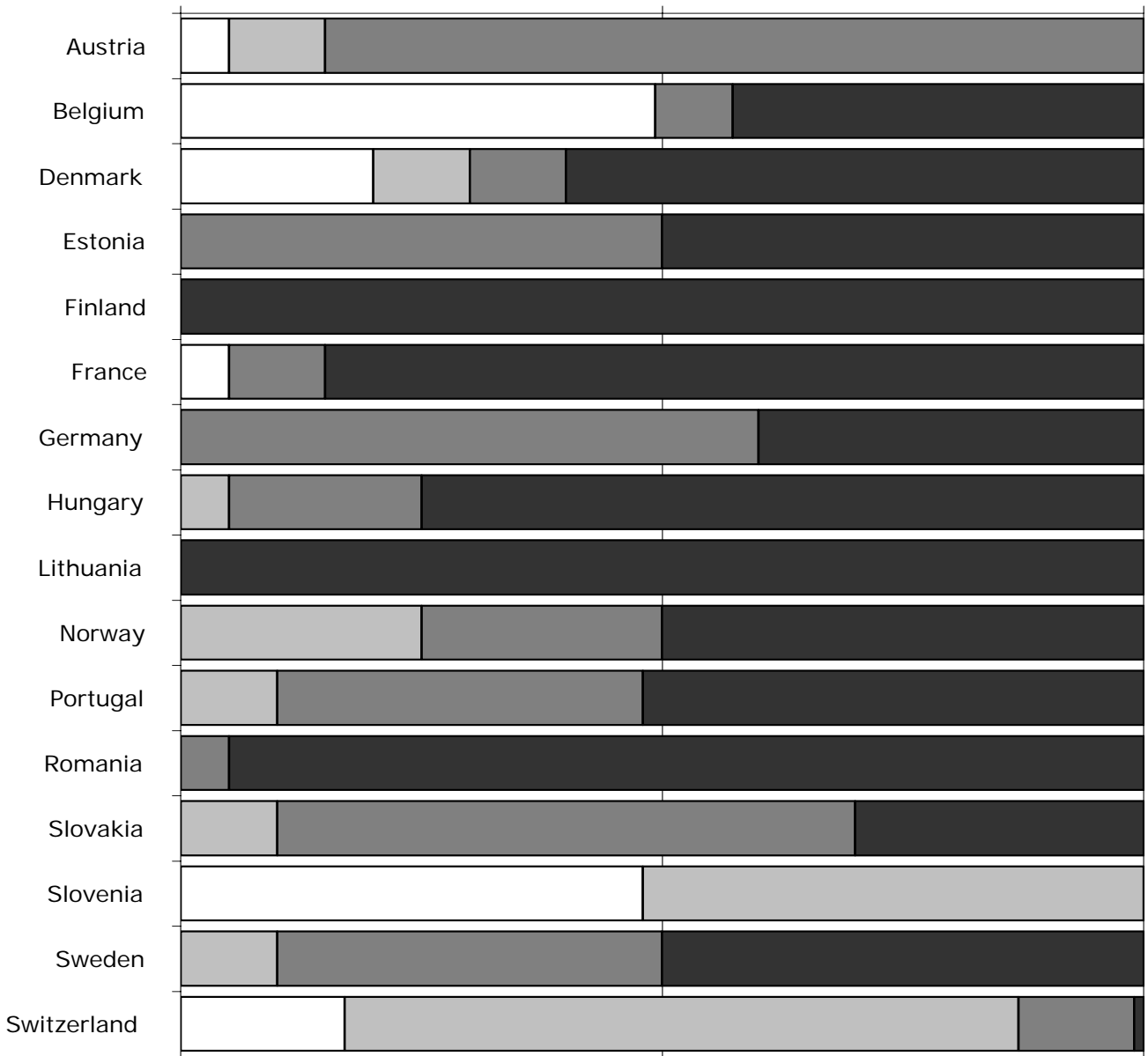
Definition of stand age



<i>Country</i>	<i>Simple estimation</i>	<i>Management plans+records; interview of forest service</i>	<i>Counting annual shoots (branch whorls)</i>	<i>Counting tree rings on recent stumps</i>	<i>Tree ring analysis (drilling trees)</i>	<i>Others</i>
AT	X		X	X	X	
BE	X	X	X	X	X	
DK			X	X	X	
EE	X				X	
FI			X		X	age table
FR			X		X	
DE		(X)		X	X	
HU	(X)	X	(X)	(X)	(X)	
IT			X	X	X	
LT	X				X	Cutting young trees outside of the plot
NO	X				X	
PT	X	X				
RO		X	X	X	X	
SK		X	X	X	X	
SI	X		X	X		
ES		X		X	X	
SE	X		X		X	
CH	X	(X)	X	X		
UK	X	X				

Methods of stand assessment

0% 50% 100%



- no age information (neither tree nor stand age is estimated)
- simple estimation (e.g. estimation in uneven-aged forests, mountain forests or broadleaved forests without good visual indicators)
- good estimation (estimation based on good visual indicators like number of branch levels of conifers, tree rings on trunks of cut trees)
- very good information (date of clear-cut, planting or sowing is know. Drilling of sample trees)

Quality of stand age assessment

Country	Reference area for stand age assessment (plot or stand size)		Forest area with stand age assessment				Other wooded land
	minimal	maximal	even-aged high forest	coppice forest	coppice with standards	uneven-aged stands	
AT	500 m ²	--	X	X	X	X	
BE	1018 m ²	1018 m ²	X				
DK	1000 m ²	--	X	X			
EE	500 m ²	--	X	X		X	
FI	2500 m ²	5000 m ²	X	not practiced in FI		X	X
FR	707 m ²	707 m ²	X	X	X		
DE	variable plot size		X	calculation possible		X	
HU	< 1000 m ²	> 150'000 m ²	X	X	X	X	
IT	530 m ²	530 m ²	X	X	X		
LT	1000 m ²	--	X	X	X	X	
NO	1000 m ²	1000 m ²	X			X	
PT	250 m ²	2000 m ²	X	X			
RO	5000 m ²	200'000 m ²	X	X	Not applied	X	X
SK	100 m ²	500 m ²	X	X	X	X	X
SI	500 m ²	--	X	X			
ES	2000 m ²	2000 m ²	X	X			
SE	1256 m ²	1256 m ²	X	X	X	X	X
CH	500 m ²	2500 m ²	X	X			
UK	500 m ²	--	X	X	X		

Reference area for and forest area with stand (plot) age assessment

<i>Resolution (single years or classes)</i>	<i>Countries</i>
Assessment in number of years	BE, DE, EE, FI, DE, HU, LT, NO, RO, SK, SI, ES, SE, CH, UK
Assessment by classes (top class)	AT (>140), IT (>120), PT(>60)

Stand age resolution

Conclusion:

Existing forest age data of European NFIs allow very restricted analyses on international level only, e.g. the proportion (%) of stands older than 120 years in even-aged high forests. But as the definitions of «even-aged» differ vastly from country to country the significance of such an indicator is doubtful.

Proposal of a new variable

As the existing definitions of stand age are different and not precise we propose our new term or variable:

Top Age, the age of dominant trees in a stand (Age_{dom}).

Top Age (Age_{dom}) is the average age of the hundred trees of largest diameter per hectare.

Top age can be assessed analogous to the well know «top height» (the average height of the hundred trees of largest diameter per hectare) for every stand (plot), independent of number of layers, tree species or age mixture, in an objective and reproducible way.

Plot size; number of largest trees to assess tree age:

200m²; 2 / 300m²; 3 / 500m²; 5 / ...





Proposed indicator

Old stands are of main interest concerning biodiversity. Thus we propose an indicator called «Old stands» and define it as follows:

An OLD STAND is a stand that is older than the half of its **natural span of life**

The natural span of life of a forest depends on natural tree species composition and site factors. To make it practicable, natural span of life should be defined by forest types e.g. 350 years for type 3.2 Subalpine and montane spruce and montane mixed spruce-silver fir forest. In this case an old stand would be a stand with an Age_{dom} of 175 years and more.

As most countries do not assess tree age of all sample trees it will be hardly possible to calculate Age_{dom} for more than two or three countries we suppose. Anyway it would be interesting and helpful to **test this indicator** even with few countries to improve and optimise this variable and indicator reference.