

# Common protocols and reference standards for assessment of adaptive traits

A joined proposal from WP2 'Standardisation'

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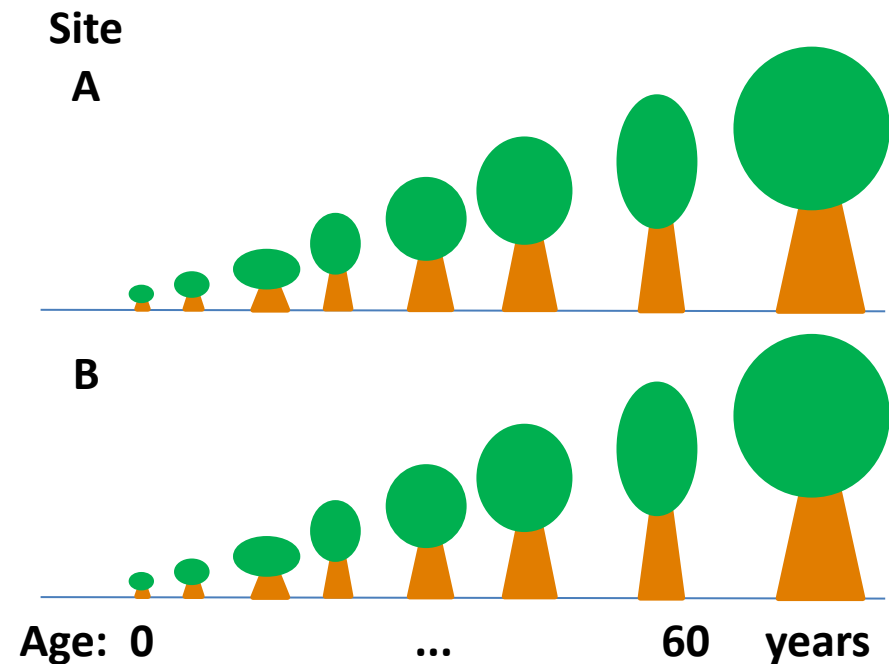
Brussels, final conference, session 6A, Wed. 6, April, 2016

## Why?

- sharing data
- different data within an institute
- different data between sites
- different data over time
- comparing results

## Criteria:

- reliable
- repeatable
- stable reference method
- easy to handle
- not time consuming
- for a defined part in the life circle
- acceptable



A selection of protocols used in a trial series at different years.

3-step	5-step	6-step	7-step
1= late flushing	1= dormant winter bud	1= dormant winter bud	1= dormant winter bud
	2= buds expanding	2= buds swollen	2= buds swollen
	3= bud-burst (first green is visible)	3= first green is visible	3= first green is visible
2= intermediate		4= leaves begin to appear, individually visible folded	4= leaves begin to appear
	4= leaves are flushing		5= individually visible folded
3= early flushing	5= leaves are fully expanded	5= leaves unfolded, fan-shaped	6= leaves unfolded, fan-shaped
		6= leaves unfolded, bright	7= leaves unfolded, bright



## D2.1: Common protocols and reference standards for selected traits and species

### 1. Species oriented

Broadleaves: 5 species/groups and general

Conifers: 5 species/groups and general

### 2. Trait oriented

Wood quality

Drought resistance

### 3. Reference standards



# Outcome on protocols



Beech	Oak	Ash	Poplar	Wild cherry	Broadleaves
Flushing	Flushing	Flushing Ash dieback ( <i>Chalara fraxinea</i> )	Bud burst Bud set <i>Melampsora laric-populina</i> <i>Marsonia brunnea</i> <i>Xanthomonas populi</i>	Flushing Leaf senescence Wood color	Straightness Forking Branch angle Branch thickness

Norway spruce	Douglas fir	Scots pine	Mediterranean pines	Larch	Conifers
Flushing	Flushing Bud set Frost hardiness Needle cast	<i>Lophodermium</i> needle cast Pine twisting rust	Vegetative phase change Reproduction Flowering Polycyclism Bark thickness	Phenology Canker "Drought" cracks	Straightness Basal sweep Forking Branch angle Branch thickness Branch number



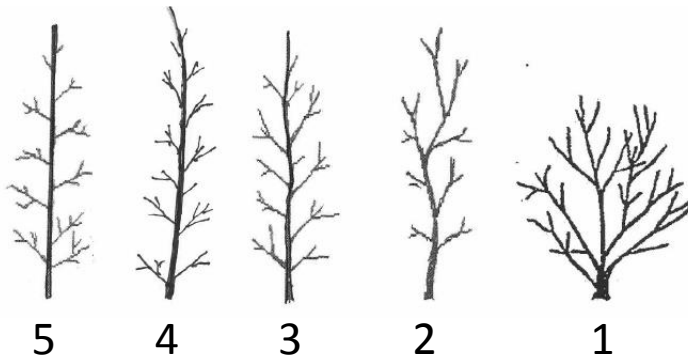
Non-specific



Specific

## Broadleaves: straightness

Score values	Text
5	Absolutely straight stem
4	In one direction slightly crooked (fairly straight)
3	Slight to moderate bends in different directions
2	Moderate to strong bends
1	No straight stem



Height [m]

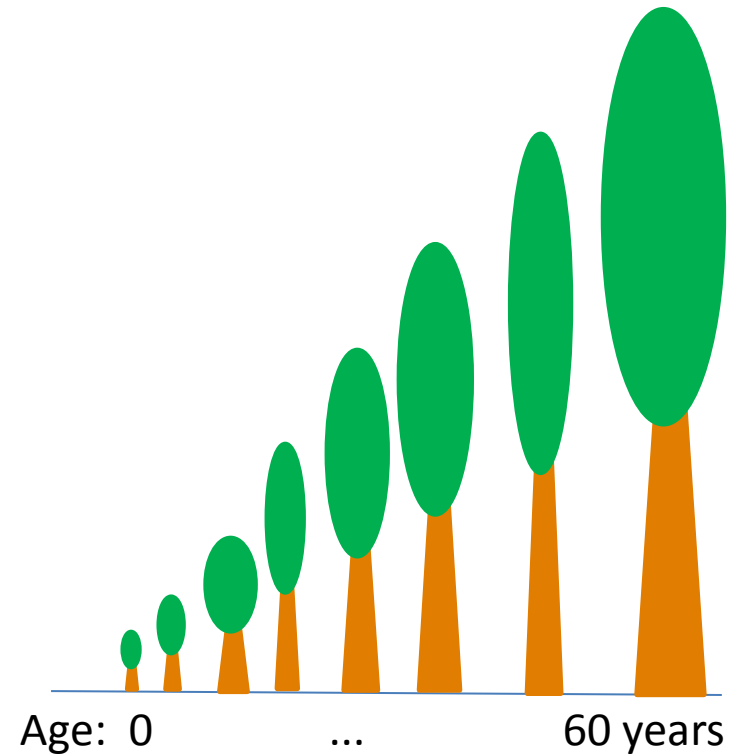
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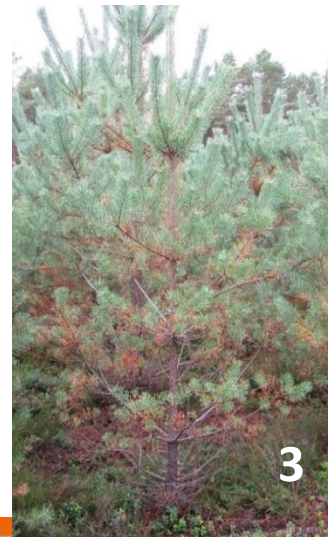
5

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## Scots pine: *Lophordermium* needle cast

Score values	Text
5	No infection
4	Weak infection, few brown needles
3	Medium infection, 10-50 % brown needles
2	Medium to severe infection, 50-100 % brown needles
1	Very severe infection, all needles brown or dropped off



Photos: S. ŚLUSARSKI - IBL

- **Type 1 ‘control genotypes’**: breeders are used *to compare performances of newly created material* towards some standards, which allow them measuring genetic gains. → **genetic control**
- **Type 2 ‘signal genotypes’**: traits, which cannot be measured but only evaluated using subjective scoring systems (such as stem architecture, phenology, disease resistance, etc.). Benchmark genotypes represent then the scores (at least the extremes) of *a given scale* (e.g. crooked stem → straight stem). → **benchmark for traits**
- **Type 3 ‘widespread common genotypes’**: for some studies in particular to monitor climate changes impact (e.g. phenology, plasticity, pest & disease epidemiology), it would be profitable to separate genetic from environmental effects. Additionally to the main experiment some few trees from various genotypes of some species could be systematically planted in any new field trial. → **network standard**



# List of reference genotypes agreed on

## Example: poplars (*Populus spec.*)



### Category 1: genetic control

According to traits, the following best commercial clones are proposed as genetic control:

Traits	Taxa	Clones
<i>Melampsora larici-populina</i> (low susceptibility under natural infection)	<i>P. deltoides</i>	Alcinde, Lena
	<i>P. trichocarpa</i>	-
	<i>P. nigra</i>	-
	<i>P. x canadensis</i>	Triplo, Soligo
	<i>P. x generosa</i>	-
	Other interspecific hybrids	Bakan, Skado
<i>Marssonina brunnea</i> (low susceptibility under natural infection)	<i>P. deltoides</i>	Alcinde, Dvina, Lux
	<i>P. trichocarpa</i>	Trichobel
	<i>P. nigra</i>	Jean Pourtet
	<i>P. x canadensis</i>	Dorskamp, Polargo
	<i>P. x generosa</i>	-
	Other interspecific hybrids	Rochester, Taro
	<i>P. deltoides</i>	-

### Category 3: network standards

Taxa	Clones
<i>P. deltoides</i>	Alcinde
<i>P. trichocarpa</i>	Trichobel
<i>P. x canadensis</i>	I-214, Dorskamp, Koster, Soligo, Vesten
<i>P. x generosa</i>	Raspalje, Beaupré
Other interspecific hybrids	Bakan, Skado, Max4

### Category 2: benchmarks for traits

#### Bud Phenology

Budflush phenology	Standard clones
Early budflush	Flevo, I-214, Soligo, Rochester, Fritzi Pauley
Medium budflush	Alcinde, I45-51, Dorskamp
Late budflush	Koster, Blanc du Poitou, Triplo



Budset phenology	Standard clones
Early budset	Flevo, Koster, Lena, Vereecken
Medium budset	I-214, Dorskamp, Blanc du Poitou
Late budset	Soligo, Triplo, Alcinde

#### Susceptibility to *Melampsora larici-populina*

Determination of rust pathotypes present in Mlp populations Virulence detected	Discriminant clone
1	Ogy. Isières
2	Luisa Avanzo, 'Aurora'
3	Brabantica
4	Unal
5	Pen

- Final publication of the common protocols

available online as

- «Flick-book»
- pdf in a series

(in preparation)



**D2.1 - Common protocols and reference standards for selected traits and species**

**TREES 4 FUTURE**  
Project no. 284181

**TREES4FUTURE - Designing Trees for the Future**

Start date of project: 1 November 2011  
Duration of project: 4 years  
Call: FP7-INFRASTRUCTURES-2011-1  
Theme: INFRA-2011.1.1.13 (Research infrastructures for forestry research)  
Funding Scheme: Combination of CP & CSA

**D2.1 – Common protocols and reference standards for selected traits and species**

Description: Common protocols and reference standards for selected traits and species: Technical cards are drawn up holding common protocols and reference standards at 2 species or at a trait level, as appropriate, and will be made publicly available to the scientific community.

Due date of deliverable: M42  
Actual submission date: M42

Organisation name of lead contractor for this deliverable: vTI (now THÜNEN)  
WP2 Leader: Bert de Cuyper (VLAGEW)

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Dissemination level	
PU Public (must be available on the website)	X
PP Restricted to other programme participants (including the Commission Services)	
RE Restricted to a group specified by the consortium (including the Commission Services)	
CO Confidential, only for members of the consortium (including the Commission Services)	

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