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Guidelines for conducting genetic monitoring in the field: *Fraxinus excelsior* L.

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INTRODUCTION

The guidelines for conducting genetic monitoring of common ash in the field shortly describe the common ash, differences to sympatric narrow-leaved ash, its reproduction, environment and threats. They provide guidance on establishing a genetic monitoring plot and on recording all field level verifiers. With its high ecological importance and utility in timber industry, this species strongly threatened by the ash dieback, is a prime candidate for genetic monitoring.

PLOT ESTABLISHMENT

Common ash is polygamous and a scattered tree species. Because of this, a preliminary field study is needed prior to plot establishment. The size and shape of the genetic monitoring plot will need to be adapted to include 50 reproducing trees, 25 functionally female (bearing fruit) and 25 functionally male (not bearing fruit). Therefore, the plot should be installed in the summer, when trees are bearing fruit. Ideally a visit in the spring should be carried out to allow for differentiation between male and hermaphrodite trees not bearing fruit (functionally male).

After the sex (and functional sex in case of hermaphrodites) has been recorded, GPS locations of all trees should be plotted as a point feature layer in a GIS software. 50 points representing trees, with the minimum distance of 30 m among each other should be randomly selected keeping the ratio of 50% functionally male and 50% functionally female trees. During plot installation these pre-selected trees must be identified in the field and marked.

The establishment of natural regeneration subplots is carried out during germination following a strong or massive fructification event.

FIGURE 1: Picture guide for the identification of ash sex.

BACKGROUND INFORMATION EXAMPLE: CROWN DIEBACK

Code	Background information on crown condition due to the ash dieback
1	healthy crown (0-10% defoliation)
2	dead branch tips visible on the crown's edge, crown otherwise in good condition (11-30% defoliation)
3	dead branches visible on the crown's edge, crown is thin so one can see through it (31-50% defoliation)
4	secondary crown is building at the trunk, thick branches without leaves visible, crown is very thin (51-80% defoliation)
5	only a small part of the crown remains (81-99% defoliation)
6	tree is dead (100% defoliation)

VERIFIERS

The verifiers recorded in the field belong to the indicator Selection. The average cost of monitoring this indicator per decade (without plot establishment) at the basic level is approximately 2000 EUR and 280 man-hours, at the standard level 5000 EUR and 930 man-hours and at the advanced level 14500 EUR and 2420 man-hours.

	Name	Basic level	Standard level	Advanced level
Verifiers	**Mortality / survival**	Counting of remaining marked trees every 10 years and after every extreme events	Same as basic level	Same as basic level
	Flowering	Stand-level estimate, every year	Individual tree level observation, during two major flowering events per decade, ideally equally spaced	Individual tree level observation, during two major flowering events per decade, ideally equally spaced
	Fructification	Stand-level estimate, every year	Individual tree level observation, the same year as the assessment of the flowering at the standard level (regardless of the fructification intensity)	Counting of fruit, during the same years as the assessment of flowering at the advanced level, regardless of the fructification intensity Seeds are collected for laboratory analyses every assessed fructification event at the advanced level
	Natural regeneration abundance	Stand-level estimate, every year	Counting of seedlings 2nd and 7th year after every assessed fructification event*	Counting of seedlings 2nd, 7th, 12th, 17th year after every assessed fructification event*
Background information	**Sex ratio**	/	Individual tree level observation, during every fructification event	Individual tree level observation of the percentage of the type of each flower type, during every fructification event
	Crown dieback	Individual tree level observation, every year	Same as basic level	Same as basic level
	DBH class distribution	/	Measurement every 10 years	Same as standard level
	Height class distribution	/	Measurement every 10 years	Same as standard level
	Bud break	/	Individual tree level observation, every 5 years	Individual tree level observation, every year
	Senescence	/	Individual tree level observation, every 5 years	Individual tree level observation, every year
	Flowering synchronisation	/	/	Individual tree level observation, during each assessed major flowering event

* Ash has dormant seed; usually dormancy lasts for two winters. Therefore, natural regeneration abundance is first recorded two years after the major fructification event. If seeds are dormant for longer in the monitored ash stand, the observation years must adapt to the duration of the dormancy.

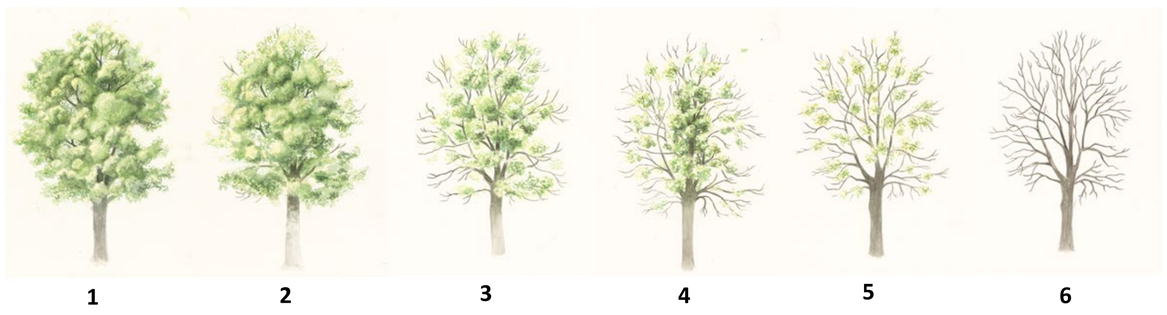

FIGURE 2: Picture guide for ash dieback estimation

Acknowledgments

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