Additional file 3

Comprehensive list of variables derived from NFI_{2002} and NFI_{2012}; N = 52

Aspect	Variable	Description
BD	Bark diversity*	diversity of bark types (based on tree species and DBH)
CH	NC	classification of naturalness (5 classes)
CH	Gini-Simpson-Index DBH	Gini-Simpson index for DBH
CH	Shannon-Index ≥ 7cm DBH	Shannon index for trees ≥ 7 cm DBH
CH	SR ≥ 7cm DBH	species richness of trees ≥ 7 cm DBH
CH	Evenness DBH ≥ 7 cm	tree species evenness (Shannon-Index) for trees ≥ 7 cm DBH
DC	DW CWDI	coarse woody debris index (CWDI) based on volume ha^{-1} per decay class; sampled ≥ 20 cm small diameter
DC	DW N DC	number of decay classes in downed deadwood
DW	DW Types	number of deadwood types (e.g. downed (complete stem or part of the stem), standing (complete stem or part of the stem, stumps, etc.)
DW	DW Vol / ha	volume of all deadwood (standing and downed) per hectare
DW_D	DW INDEX*	deadwood index; calculated like CWDI, including volume ha^{-1} per decay classes and per type of deadwood
DW_D	DW l DBH	downed deadwood mean diameter
DW_D	DW l dm sd	standard deviation of diameter of downed deadwood
DW_D	DW l N / ha	number of downed deadwood pieces per hectare
DW_D	DW l Vol / ha	volume of downed deadwood per hectare
DW_D	VarD DW l	coefficient of variance of diameter of downed deadwood
DW_S	DW st DBH	mean DBH of standing deadwood
DW_S	DW st dm sd	standard deviation of DBH of standing deadwood
DW_S	DW st N / ha	number of standing deadwood snags per hectare
DW_S	DW st Vol / ha	volume of standing deadwood per hectare
DW_S	VarD DW st	coefficient of variance of DBH of standing deadwood
FD	Fruit and Flowers*	availability of different seeds, fruits, pollen (based on species and DBH)
GS	Age	stand age, missing for uneven-aged forests
GS	Basal area / ha	basal area per hectare
GS	Biomass / ha	above ground biomass per hectare
GS	DBHq	quadratic mean diameter at breast height of stands
GS	Growing stock / ha	volume per hectare
GS	Height	mean stand height
GS	N / ha	number of trees per hectare
LLT	VolBigTrees ≥ 40 cm DBH	volume per hectare of tress ≥ 40 cm DBH
LLT	VolBigTrees ≥ 60 cm DBH	volume per hectare of tress ≥ 60 cm DBH
LLT	VolBigTrees ≥ 80 cm DBH	volume per hectare of tress ≥ 80 cm DBH
REG	Cover ratio reg	Percent cover of regeneration
REG	N forest relevant species	number of forest relevant species (NFI classification)
REG	Shannon-Index < 7cm DBH	Shannon index for tree regeneration complete (regeneration 1 and 2)
REG	Shannon-Index Reg 1	Shannon index for regeneration 1 (20 - 50 cm height)

REG	Shannon-Index Reg 2	Shannon index for regeneration 2 (≥ 50 cm height and DBH ≤ 7 cm)
REG	SR < 7cm DBH	species richness of regeneration complete (regeneration 1 and 2)
REG	SR Reg1	species richness of regeneration 1 (20 - 50 cm height)
REG	SR Reg2	species richness of regeneration 2 (≥ 50 cm height and DBH ≤ 7 cm)
REG	Evenness DBH ≤ 7 cm	tree species evenness (Shannon-Index) for trees ≤ 7 cm DBH
REG	Evenness Reg 2	tree species evenness (Shannon-Index) for regeneration 2 (≥ 50 cm height and DBH ≤ 7 cm)
UA	Age sd	standard deviation of stand age
UA	Basal area / ha sd	standard deviation of basal area per hectare
UA	DBH sd	standard deviation of quadratic mean diameter at breast height of stands
UA	N DCl	number of tree diameter classes (class width 10 cm)
UA	VarAge	coefficient of variance of tree age
UA	VarBa/ha	coefficient of variance of basal area per hectare
UA	VarD	coefficient of variance of mean tree diameter
VH	Height sd	standard deviation of stand height
VH	N HCl	number of tree height classes (class width 2 m)
VH	VarH	coefficient of variance of average tree height

*: Calculation of ‘Bark diversity’ and ’Flower diversity’ is performed according to the following tables:

Tree species	**Bark Type**	**DBH Type 1**	**DBH Type 2**	**DBH Type 3**
Acer pseudoplatanus	scaly	< 20 cm	20 - 40 cm	> 40 cm
Betula spp.	furrowed	< 15 cm	15 - 25 cm	> 25 cm
Populus spp.	furrowed	< 15 cm	15 - 25 cm	> 25 cm
Fagus sylvatica	smooth	omitted	omitted	omitted
Pseudotsuga menziesii	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Quercus spp.	furrowed	< 10 cm	10 - 30 cm	> 30 cm
Sorbus torminalis	scaly	< 15 cm	>15 cm	omitted
Larix decidua	furrowed	< 10 cm	10 - 30 cm	> 30 cm
Alnus spp.	furrowed	< 15 cm	15 - 30 cm	> 30 cm
Fraxinus excelsior	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Acer campestre	scaly	< 20 cm	>20 cm	omitted
Picea abies	scaly	< 20 cm	20 - 40 cm	> 40 cm
Carpinus betulus	smooth	< 30 cm	>30 cm	omitted
Larix kaempferi	furrowed	< 10 cm	10 - 30 cm	> 30 cm
Castanea sativa	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Pinus spp.	scaly	< 15 cm	15 - 30 cm	> 30 cm
Prunus avium	smooth	omitted	omitted	omitted
Tilia spp.	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Populus balsamifera	furrowed	< 15 cm	15 - 25 cm	> 25 cm
Quercus rubra	furrowed	< 20 cm	20 - 40 cm	> 40 cm
Robinia pseudoacacia	furrowed	< 10 cm	10 - 25 cm	> 25 cm
Acer platanoides	scaly	< 15 cm	15 - 35 cm	> 35 cm
Pinus nigra	scaly	< 15 cm	15 - 30 cm	> 30 cm
broadleaf species	?	?	?	?
conifer species	?	?	?	?
Abies alba	scaly	< 20 cm	20 - 40 cm	> 40 cm
Ulmus spp.	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Sorbus spp.	smooth	omitted	omitted	omitted
Salix spp.	furrowed	< 20 cm	20 - 35 cm	> 35 cm
Sorbus domestica	scaly	< 20 cm	20 - 40 cm	> 40 cm
Taxus baccata	scaly	< 20 cm	>20 cm	omitted
Sorbus aria	smooth/scaly	< 20 cm	>20 cm	omitted
Malus sylvestris	scaly	< 20 cm	20 - 40 cm	> 40 cm
Pyrus pyraster	scaly	< 20 cm	20 - 40 cm	> 40 cm

To calculate bark diversity, each living tree is assigned to a bark category and shape. Example for spruce, DBH: 30 cm → ‘Sp_scaly_T2’
Bark diversity at plot level is the number of different types of barks and their shapes

Tree species	Fruct. age	Pollination	Fruit type
Acer pseudoplatanus	30	cross + animal	schizocarpic fruit
Betula spp.	25	cross + wind	wingnut
Populus balsamifera	10	cross + wind	capsule fruit
Fagus sylvatica	60	cross + wind	nut
Pseudotsuga menziesii	25	cross + wind	cone
Quercus spp.	65	cross + wind	nut
Sorbus torminalis	15	cross + animal	apple fruit
Larix decidua	35	cross + wind	cone
Alnus spp.	25	cross + wind	cone
Fraxinus excelsior	40	cross + wind	nut
Acer campestre	40	cross + animal	schizocarpic fruit
Picea abies	55	cross + wind	cone
Carpinus betulus	25	cross + wind	nut
Larix kaempferi	35	cross + wind	cone
Castanea sativa	25	cross + animal	capsule fruit
Pinus spp.	40	cross + wind	cone
Prunus avium	20	cross + wind	drupe
Tilia spp.	40	cross + animal	nut
Populus balsamifera	10	cross + wind	capsule fruit
Quercus rubra	50	cross + wind	nut
Robinia pseudoacacia	20	cross + animal	legume
Acer platanoides	30	cross + animal	schizocarpic fruit
Pinus nigra	40	cross + wind	cone
broadleaf species	0	0	0
conifer species	0	0	0
Abies alba	60	cross + wind	cone
Ulmus spp	35	self	wingnut
Sorbus spp.	10	cross + animal	apple fruit
Salix spp.	15	cross + animal	capsule fruit
Sorbus domestica	10	cross + animal	apple fruit
Taxus baccata	30	wind	cone
Sorbus aria	15	cross + animal	apple fruit
Malus sylvestris	15	cross + animal	apple fruit
Pyrus pyraster	15	cross + animal	apple fruit

Like bark diversity, diversity of fruiting and flowering trees is calculated in a similar way. Based on tree species, tree age, pollination and type of fruit, the number of different types of living and fruiting / flowering trees is aggregated. Example 1: oak, 100 years old → 'Oak_c+w_nut'

Example 2: oak, 20 years old → '0' is not counted because no fruit or flowering possible yet

For each living tree on a sampling plot, bark type and fruiting and flowering was calculated and the sum of all (different) present types on plot level is aggregated.