

## Supplementary Material

**Tab. S1** - Proportion of regenerating species over regenerating gap, measured by field survey.

Sites	Regeneration species	Regenerating area (m <sup>2</sup> )	Gap area of site (m <sup>2</sup> )	Percentage (%)
SdF	<i>Fagus sylvatica</i>	260	466683.756	0.0557
SdF	<i>Carpinus betulus</i>	90		0.0193
SdF	<i>Corylus avellana</i>	215		0.0461
San Martino	<i>Carpinus betulus</i>	30	435436.788	0.0064
MN	<i>Carpinus betulus</i>	62		0.0142
MN	<i>Picea abies</i>	3		0.0007
MN	<i>Colylus avellana</i>	20		0.0046
MN	<i>Larix decidua</i>	1.5		0.0003
MN	<i>Fagus sylvatica</i>	3		0.0007
Scereda	<i>Ailanthus altissima</i>	5	360119.517	0.0014
Scereda	<i>Castanea sativa</i>	1		0.0003

**Tab. S2** - Proportion of regenerating species over regenerating gap, measured by drone survey.

<b>Sites</b>	<b>Regeneration species</b>	<b>Regenerating area (m<sup>2</sup>)</b>	<b>Gap area of site (m<sup>2</sup>)</b>	<b>Percentage (%)</b>
Scereda	<i>Ailanthus altissima</i>	150	360119.517	0.0417
SdF	<i>Fagus sylvatica</i>	672	466683.756	0.1440
SdF	<i>Robinia</i>	20		0.0043
MN	<i>Fagus sylvatica</i>	371	435436.788	0.0852
MN	<i>Carpinus betulus</i>	454		0.1043
MN	<i>Larix decidua</i>	97		0.0223
MN	<i>Acer</i> spp.	14		0.0032

**Tab. S3** - Regeneration profile from the Italian National Forest Inventory (2015): class 1 (h=50–130 cm; Nrin1\_ha: number ha<sup>-1</sup>; Wrin1\_ha: dry biomass Mg ha<sup>-1</sup>; Crin1\_ha: carbon stock Mg ha<sup>-1</sup>), class 2 (h>130 cm, d=0–2.4 cm; Nrin2\_ha: number ha<sup>-1</sup>; Wrin2\_ha: dry biomass Mg ha<sup>-1</sup>; Crin2\_ha: carbon stock Mg ha<sup>-1</sup>), class 3 (h>130 cm, d=2.5–4.4 cm; Nrin3\_ha: number ha<sup>-1</sup>; Wrin3\_ha: dry biomass Mg ha<sup>-1</sup>; Crin3\_ha: carbon stock Mg ha<sup>-1</sup>).

ID	Forest type (dominant species)	Nrin1_ha	Wrin1_ha	Crin1_ha	Nrin2_ha	Wrin2_ha	Crin2_ha	Nrin3_ha	Wrin3_ha	Crin3_ha
21923	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22325	<i>Fagus sylvatica</i>	1989.4	0.1	0.0	2785.2	0.9	0.5	795.8	1.7	0.9
23519	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24741	<i>Fagus sylvatica</i>	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26042	<i>Fagus sylvatica</i>	397.9	0.0	0.0	2387.3	0.8	0.4	795.8	1.7	0.9
27694	<i>Fagus sylvatica</i>	0.0	0.0	0.0	397.9	0.1	0.1	795.8	1.7	0.9
28066	<i>Fagus sylvatica</i>	795.8	0.2	0.1	795.8	0.6	0.3	795.8	1.7	0.9
29320	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29833	<i>Fagus sylvatica</i>	397.9	0.0	0.0	397.9	0.1	0.1	795.8	1.7	0.9
30752	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30776	<i>Fagus sylvatica</i>	0.0	0.0	0.0	795.8	0.4	0.2	1989.4	4.3	2.1
31195	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31619	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31642	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33079	<i>Fagus sylvatica</i>	5968.3	0.2	0.1	1193.7	0.4	0.2	1193.7	2.6	1.3
33568	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33569	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34124	<i>Fagus sylvatica</i>	4376.8	0.1	0.1	397.9	0.1	0.1	0.0	0.0	0.0
34593	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36204	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36245	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41528	<i>Fagus sylvatica</i>	397.9	0.0	0.0	0.0	0.0	0.0	1193.7	2.6	1.3
91369	<i>Fagus sylvatica</i>	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13526	<i>Castanea sativa</i>	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19283	<i>Castanea sativa</i>	795.8	0.2	0.1	795.8	0.3	0.1	0.0	0.0	0.0
20427	<i>Castanea sativa</i>	2387.3	0.1	0.0	1591.5	0.5	0.3	397.9	0.9	0.4
23927	<i>Castanea sativa</i>	0.0	0.0	0.0	795.8	0.3	0.1	0.0	0.0	0.0
23935	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25586	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26377	<i>Castanea sativa</i>	1193.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27193	<i>Castanea sativa</i>	2785.2	0.1	0.0	1591.5	0.5	0.3	397.9	0.9	0.4
28451	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	397.9	0.9	0.4
28552	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28885	<i>Castanea sativa</i>	1591.5	0.1	0.0	397.9	0.1	0.1	0.0	0.0	0.0
29326	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30258	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ID	Forest type (dominant species)	Nrin1_ha	Wrin1_ha	Crin1_ha	Nrin2_ha	Wrin2_ha	Crin2_ha	Nrin3_ha	Wrin3_ha	Crin3_ha
32594	<i>Castanea sativa</i>	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33076	<i>Castanea sativa</i>	397.9	0.0	0.0	1989.4	0.7	0.3	0.0	0.0	0.0
34073	<i>Castanea sativa</i>	0.0	0.0	0.0	397.9	0.1	0.1	0.0	0.0	0.0
34570	<i>Castanea sativa</i>	2387.3	0.1	0.0	795.8	0.3	0.1	397.9	0.9	0.4
36643	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37173	<i>Castanea sativa</i>	1193.7	0.0	0.0	795.8	0.3	0.1	795.8	1.7	0.9
37174	<i>Castanea sativa</i>	397.9	0.0	0.0	795.8	0.3	0.1	0.0	0.0	0.0
38792	<i>Castanea sativa</i>	795.8	0.0	0.0	397.9	0.1	0.1	0.0	0.0	0.0
40396	<i>Castanea sativa</i>	397.9	0.0	0.0	795.8	0.3	0.1	397.9	0.9	0.4
40906	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42527	<i>Castanea sativa</i>	7559.9	0.2	0.1	6366.2	2.1	1.1	1591.5	3.4	1.7
42565	<i>Castanea sativa</i>	0.0	0.0	0.0	397.9	0.1	0.1	0.0	0.0	0.0
48103	<i>Castanea sativa</i>	5968.3	0.2	0.1	1193.7	0.4	0.2	1193.7	2.6	1.3
23913	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25552	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33628	Antropogene managed	397.9	0.0	0.0	0.0	0.0	0.0	795.8	1.7	0.9
34115	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34560	Antropogene managed	0.0	0.0	0.0	397.9	0.1	0.1	795.8	1.7	0.9
34632	Antropogene managed	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35614	Antropogene managed	397.9	0.0	0.0	2387.3	0.8	0.4	0.0	0.0	0.0
38205	Antropogene managed	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39945	Antropogene managed	2387.3	0.1	0.0	3183.1	1.1	0.5	2785.2	6.0	3.0
41446	Antropogene managed	1989.4	0.1	0.0	0.0	0.0	0.0	397.9	0.9	0.4
43045	Antropogene managed	1193.7	0.0	0.0	397.9	0.1	0.1	0.0	0.0	0.0
43522	Antropogene managed	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50926	Antropogene managed	1193.7	0.0	0.0	7559.9	2.5	1.3	397.9	0.9	0.4
79228	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87200	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90542	Antropogene managed	397.9	0.0	0.0	795.8	0.3	0.1	397.9	0.9	0.4
23919	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29386	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34068	<i>Acer</i> spp.	397.9	0.0	0.0	1591.5	0.5	0.3	0.0	0.0	0.0
34100	<i>Acer</i> spp.	150401.4	4.9	2.5	0.0	0.0	0.0	0.0	0.0	0.0
34574	<i>Acer</i> spp.	397.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36646	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37266	<i>Acer</i> spp.	795.8	0.0	0.0	2387.3	1.0	0.5	0.0	0.0	0.0
37785	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38798	<i>Acer</i> spp.	2387.3	0.3	0.1	0.0	0.0	0.0	397.9	0.9	0.4
38808	<i>Acer</i> spp.	7957.7	0.3	0.1	1193.7	0.4	0.2	0.0	0.0	0.0
40948	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43623	<i>Acer</i> spp.	4376.8	0.1	0.1	1591.5	0.5	0.3	0.0	0.0	0.0

**Tab. S4** - Deadwood profile from the Italian National Forest Inventory (2015): standing dead trees (Napm\_ha: number ha<sup>-1</sup>; Gapm\_ha: basal area m<sup>2</sup> ha<sup>-1</sup>; Vapm\_ha: volume m<sup>3</sup> ha<sup>-1</sup>; W4apm\_ha: dry biomass Mg ha<sup>-1</sup>; Capm\_ha: carbon stock Mg ha<sup>-1</sup>) and ground coarse woody debris (Vne\_ha: volume m<sup>3</sup> ha<sup>-1</sup>; Wne\_ha: dry weight Mg ha<sup>-1</sup>; Cne\_ha: carbon stock Mg ha<sup>-1</sup>).

ID	Forest type (dominant species)	Napm_ha	Gapm_ha	Vapm_ha	W4apm_ha	Capm_ha	Vne_ha	Wne_ha
21923	<i>Fagus sylvatica</i>	75.3	1.1	3.7	1.9	1.0	4.0	1.3
22325	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23519	<i>Fagus sylvatica</i>	94.2	1.9	12.3	6.7	3.4	0.0	0.0
24741	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	3.4	1.4
26042	<i>Fagus sylvatica</i>	37.7	0.3	2.0	1.1	0.5	0.9	0.5
27694	<i>Fagus sylvatica</i>	37.7	0.3	0.8	0.3	0.2	2.9	1.3
28066	<i>Fagus sylvatica</i>	37.7	3.1	36.0	16.5	8.3	40.2	16.5
29320	<i>Fagus sylvatica</i>	94.2	2.9	27.0	13.9	6.9	0.1	0.0
29833	<i>Fagus sylvatica</i>	37.7	2.9	34.0	14.5	7.3	3.3	1.5
30752	<i>Fagus sylvatica</i>	416.7	2.0	4.4	2.0	1.0	0.0	0.0
30776	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.2	0.1
31195	<i>Fagus sylvatica</i>	2102.4	9.0	30.4	16.9	8.4	0.0	0.0
31619	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	1.0	0.5
31642	<i>Fagus sylvatica</i>	18.8	6.3	54.2	29.6	14.8	0.0	0.0
33079	<i>Fagus sylvatica</i>	207.2	4.1	26.1	13.0	6.5	1.6	0.7
33568	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.4	0.2
33569	<i>Fagus sylvatica</i>	198.9	0.4	0.4	0.2	0.1	8.3	3.3
34124	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34593	<i>Fagus sylvatica</i>	56.5	0.7	1.5	0.8	0.4	9.9	3.7
36204	<i>Fagus sylvatica</i>	75.3	4.6	30.6	11.7	5.8	35.5	14.1
36245	<i>Fagus sylvatica</i>	18.8	0.1	0.6	0.3	0.2	0.0	0.0
41528	<i>Fagus sylvatica</i>	0.0	0.0	0.0	0.0	0.0	2.2	0.9
91369	<i>Fagus sylvatica</i>	56.5	1.7	14.0	7.6	3.8	0.5	0.2
13526	<i>Castanea sativa</i>	150.7	2.6	13.4	5.7	2.8	1.9	0.5
19283	<i>Castanea sativa</i>	18.8	0.5	0.6	0.3	0.1	0.6	0.2
20427	<i>Castanea sativa</i>	150.7	2.5	11.1	5.9	2.9	5.9	2.0
23927	<i>Castanea sativa</i>	18.8	0.3	1.4	0.8	0.4	12.1	4.9
23935	<i>Castanea sativa</i>	37.7	3.4	37.1	19.6	9.8	23.6	8.7
25586	<i>Castanea sativa</i>	613.3	12.0	89.8	45.4	22.7	31.6	10.6
26377	<i>Castanea sativa</i>	357.9	6.5	41.9	22.5	11.3	0.2	0.1
27193	<i>Castanea sativa</i>	1909.4	12.4	77.0	37.4	18.7	0.0	0.0
28451	<i>Castanea sativa</i>	217.8	0.5	2.5	1.4	0.7	16.8	5.5
28552	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.9	0.3
28885	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	2.2	0.7
29326	<i>Castanea sativa</i>	198.9	1.3	0.9	0.4	0.2	6.4	2.7
30258	<i>Castanea sativa</i>	804.0	6.8	45.9	22.6	11.3	35.7	15.2
32594	<i>Castanea sativa</i>	37.7	0.4	2.3	1.3	0.6	1.2	0.6

ID	Forest type (dominant species)	Napm_ha	Gapm_ha	Vapm_ha	W4apm_ha	Capm_ha	Vne_ha	Wne_ha
33076	<i>Castanea sativa</i>	37.7	0.7	5.8	2.9	1.4	0.0	0.0
34073	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	69.6	26.8
34570	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36643	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	9.5	2.8
37173	<i>Castanea sativa</i>	113.0	1.6	11.1	5.8	2.9	1.8	0.6
37174	<i>Castanea sativa</i>	56.5	2.4	18.7	10.2	5.1	28.3	11.9
38792	<i>Castanea sativa</i>	37.7	1.4	12.8	7.0	3.5	10.8	5.0
40396	<i>Castanea sativa</i>	18.8	0.2	0.7	0.3	0.2	39.8	20.1
40906	<i>Castanea sativa</i>	18.8	0.6	5.5	3.0	1.5	1.8	0.6
42527	<i>Castanea sativa</i>	131.8	3.1	25.2	13.7	6.9	0.0	0.0
42565	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48103	<i>Castanea sativa</i>	0.0	0.0	0.0	0.0	0.0	46.4	15.9
23913	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.6	0.2
25552	Antropogene managed	1446.8	10.5	64.3	32.8	16.4	1.7	0.6
33628	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34115	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34560	Antropogene managed	198.9	0.4	0.9	0.5	0.3	0.0	0.0
34632	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35614	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.5	0.2
38205	Antropogene managed	0.0	0.0	0.0	0.0	0.0	3.0	1.0
39945	Antropogene managed	18.8	0.3	2.0	0.9	0.5	0.6	0.2
41446	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43045	Antropogene managed	94.2	1.0	5.0	2.7	1.4	1.3	0.4
43522	Antropogene managed	94.2	1.3	7.3	3.9	1.9	22.4	7.1
50926	Antropogene managed	113.0	1.5	6.0	3.1	1.5	0.0	0.0
79228	Antropogene managed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87200	Antropogene managed	0.0	0.0	0.0	0.0	0.0	3.6	1.5
90542	Antropogene managed	18.8	1.1	8.4	3.9	2.0	1.4	0.4
23919	<i>Acer</i> spp.	131.8	3.6	31.4	15.4	7.7	126.9	60.4
29386	<i>Acer</i> spp.	94.2	2.0	16.5	8.7	4.4	32.3	10.7
34068	<i>Acer</i> spp.	94.2	1.7	10.3	5.2	2.6	0.3	0.1
34100	<i>Acer</i> spp.	94.2	3.5	30.9	16.6	8.3	3.5	1.5
34574	<i>Acer</i> spp.	18.8	0.3	1.6	0.9	0.5	0.0	0.0
36646	<i>Acer</i> spp.	454.4	2.4	5.6	2.7	1.3	3.9	1.3
37266	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	2.5	0.9
37785	<i>Acer</i> spp.	113.0	1.7	10.2	5.5	2.8	2.7	1.3
38798	<i>Acer</i> spp.	18.8	0.1	0.9	0.5	0.2	0.0	0.0
38808	<i>Acer</i> spp.	244.9	5.6	43.6	23.8	11.9	4.2	2.0
40948	<i>Acer</i> spp.	0.0	0.0	0.0	0.0	0.0	0.6	0.2
43623	<i>Acer</i> spp.	18.8	0.4	1.6	0.8	0.4	0.2	0.1