

## Supplementary material

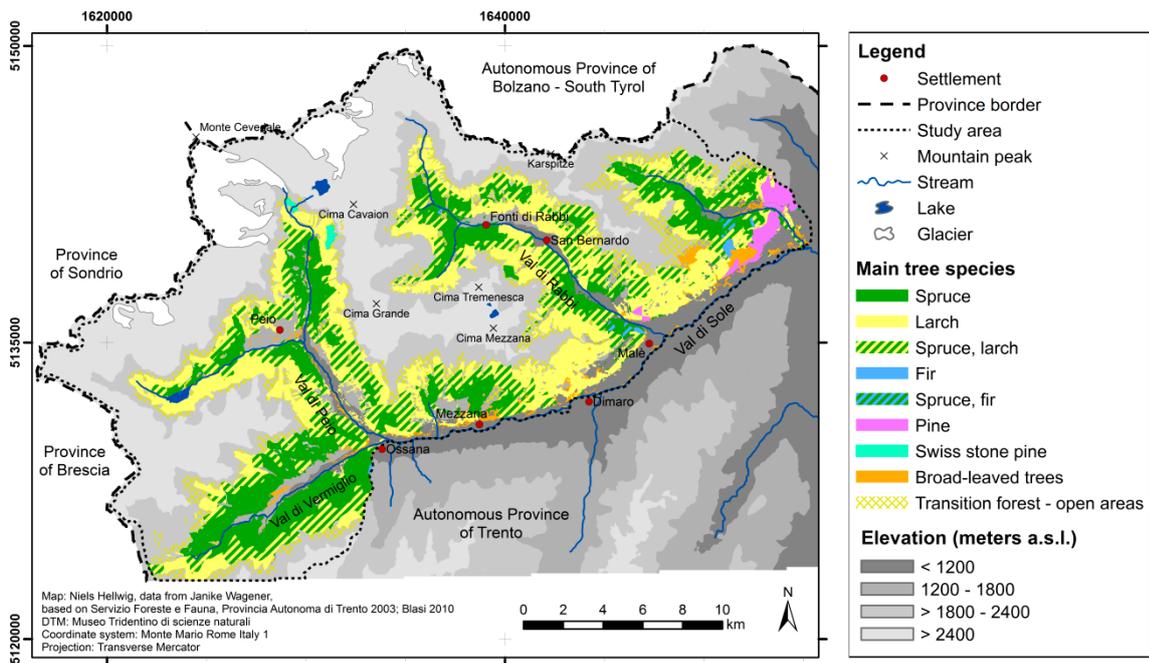
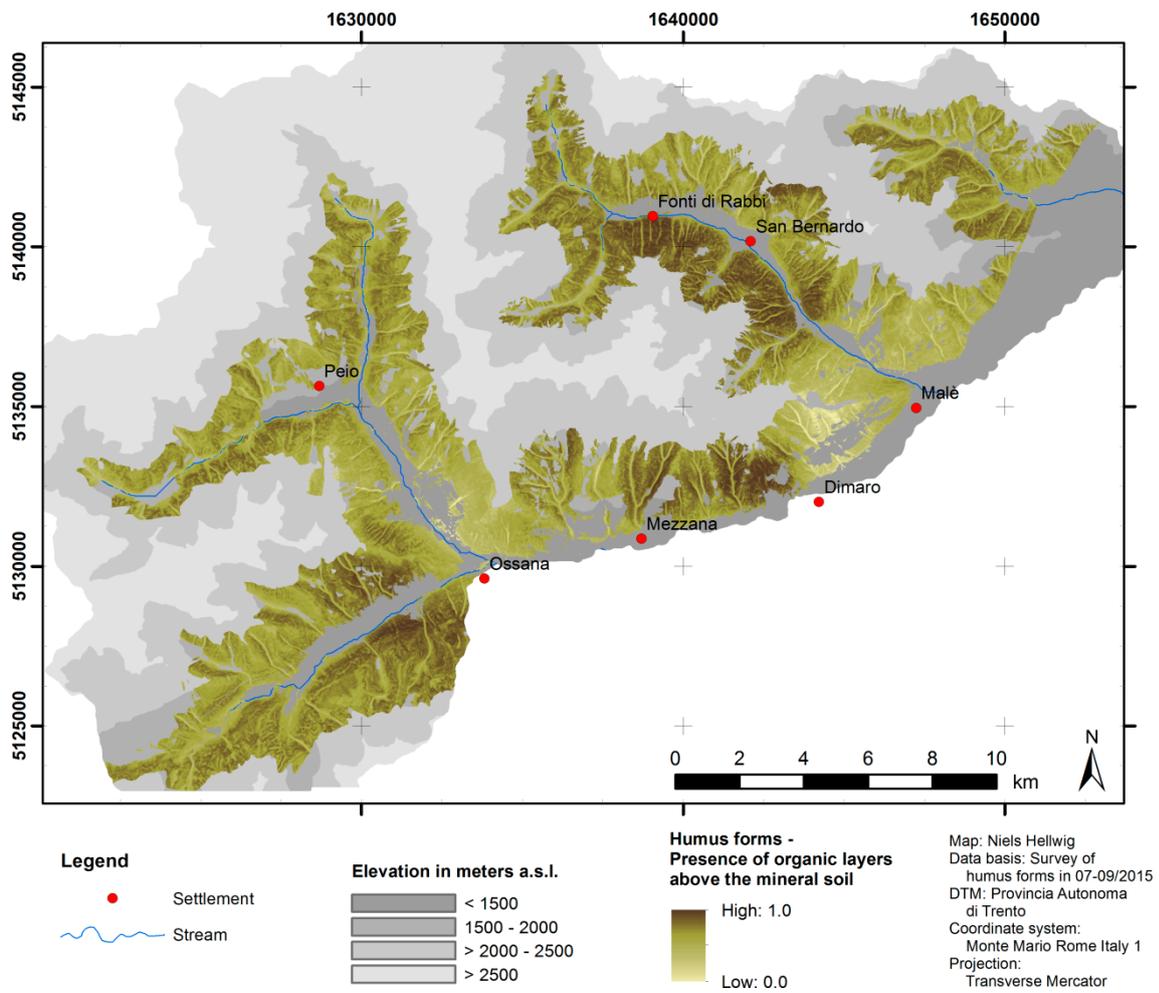
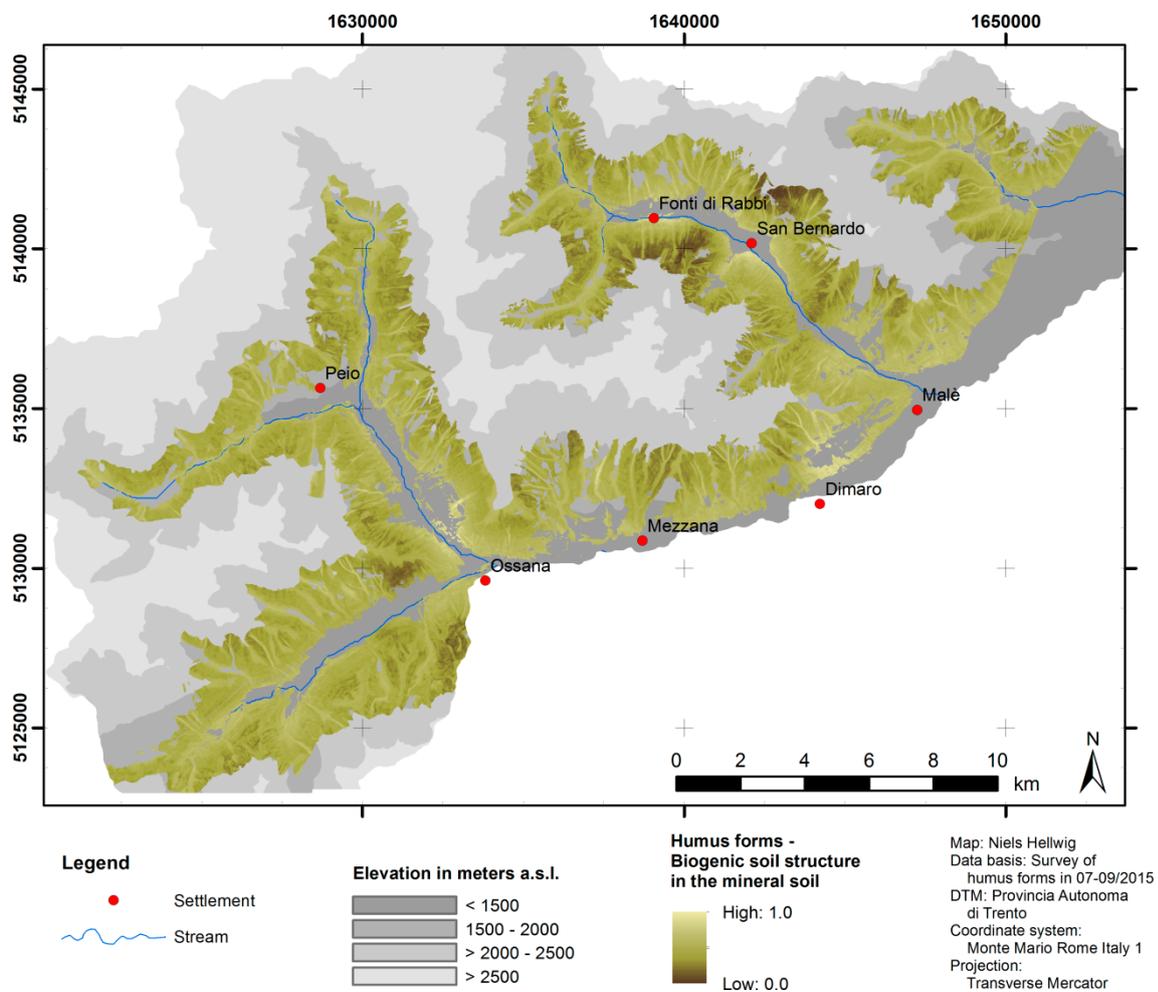


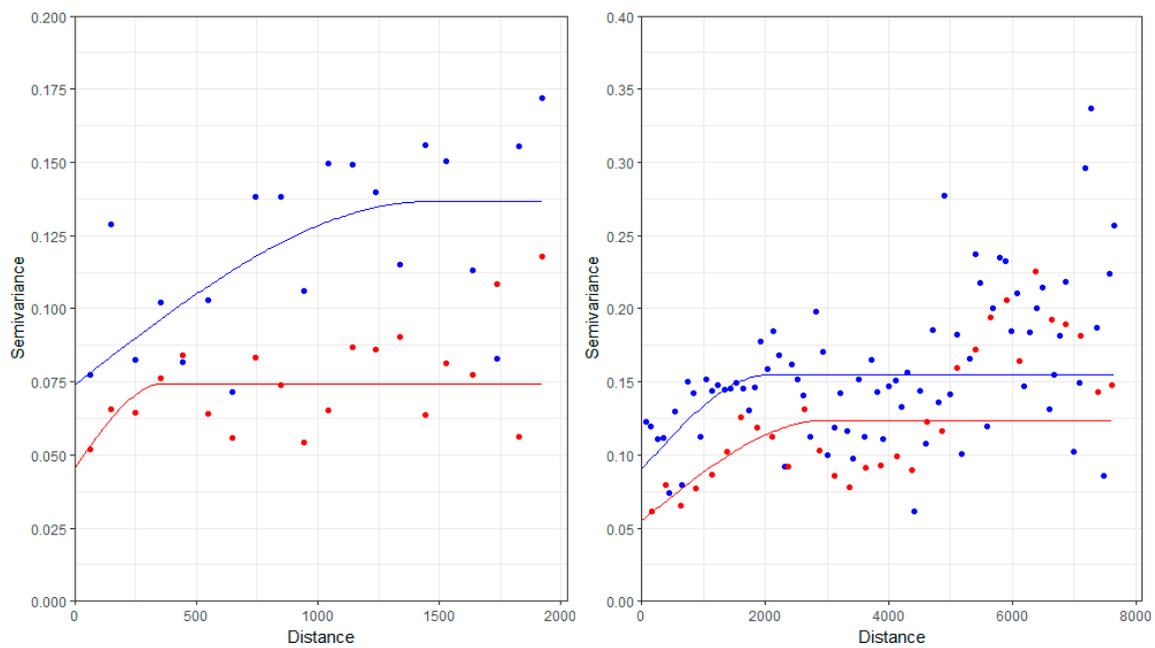
Figure S1. Distribution of forest tree species in the study area.



**Figure S2.** Predicted distribution of the presence of organic layers above the mineral soil at the landscape scale.



**Figure S3.** Predicted distribution of the biogenic soil structure in the mineral soil at the landscape scale.



**Figure S4.** Variograms used for kriging of the model residuals from random forest at the slope scale (on the left) and at the landscape scale (on the right). Lines show the variogram fits of a spherical model. Red: Model of the presence of organic layers above the mineral soil. Blue: Model of the biogenic soil structure in the mineral soil.

**Table S1.** Humus forms (according to [34,35]) sampled at 30 sites within the study area (A1-A30)

Site	Elevation a.s.l. (m)	Ground cover (percentage at site)	Dominant humus form classes (according to [3])
A1	933	Moss (80%)	Moder
		Litter (20%)	Moder
A2	1035	Litter (100%)	Mull
A3	1044	Grass (100%)	Mull
A4	1096	Litter (70%)	Moder
		Grass (30%)	Moder
A5	1179	Litter (70%)	Amphi
		Grass (30%)	Amphi
A6	1206	Litter (80%)	Moder
		Grass (20%)	Mullmoder
A7	1211	Grass (90%)	Mullmoder
		Litter (10%)	Eroded Moder
A8	1254	Litter (90%)	Mull
		Grass (10%)	Mull
A9	1310	Grass (80%)	Mull
		Litter (20%)	Mull
A10	1317	Grass (70%)	Mull
		Litter (30%)	Moder
A11	1385	Litter (60%)	Eroded Moder
		Grass (40%)	Moder
A12	1388	Litter (60%)	Amphi
		Grass (40%)	Amphi
A13	1407	Litter (50%)	Moder
		Grass (30%)	Moder
		Moss (20%)	Moder
A14	1422	Litter (60%)	Mull
		Grass (40%)	Mull
A15	1462	Moss (60%)	Mullmoder
		Litter (40%)	Moder
A16	1492	Grass (60%)	Mullmoder
		Litter (40%)	Moder
A17	1508	Grass (100%)	Moder
A18	1528	Litter (90%)	Moder
		Grass (10%)	Amphi
A19	1538	Grass (100%)	Mullmoder
A20	1597	Grass (70%)	Mullmoder
		Litter (30%)	Amphi
A21	1610	Litter (80%)	Mullmoder
		Grass (20%)	Mull
A22	1630	Grass (50%)	Moder
		Litter (50%)	Moder
A23	1687	Litter (50%)	Moder
		Grass (40%)	Mull
		Moss (10%)	Amphi
A24	1735	Grass (100%)	Mull
A25	1777	Grass (100%)	Mull
A26	1800	Litter (60%)	Amphi
		Grass (40%)	Amphi
A27	1807	Grass (70%)	Mullmoder
		Litter (30%)	Moder
A28	1833	Grass (90%)	Moder
		Litter (10%)	Moder
A29	1881	Grass (100%)	Moder
A30	2046	Grass (70%)	Mull
		Shrubs (20%)	Moder
		Litter (10%)	Mull

**Table S2.** Humus form classes sampled at different ground cover types at the local scale (sites N1–N3 and S6–S8).

Site	Sample label	Ground cover	Dominant humus form classes (according to [3])
N1	N1F1	Fern	Amphi
	N1F2	Fern	Mull
	N1F3	Fern	Mull
	N1M1	Moss	Mull
	N1M2	Moss	Amphi
	N1M3	Moss	Mull
	N1vMa	Moss	Mullmoder
	N1vLa	Litter	Eroded Moder
	N1vLb	Litter	Moder
	N1vBa	Branches	Mullmoder
	N1vBb	Branches	Moder
	N1vBc	Branches	Moder
N2	N2M1	Moss	Moder
	N2M2	Moss	Moder
	N2M3	Moss	Moder
	N2vMa	Moss	Moder
	N2vLa	Litter	Moder
	N2vLb	Litter	Moder
	N2vBa	Branches	Moder
N3	N3G1	Grass	Moder
	N3G2	Grass	Moder
	N3G3	Grass	Moder
	N3vGa	Grass	Moder
	N3M1	Moss	Moder
	N3M2	Moss	Moder
	N3M3	Moss	Moder
	N3vLa	Litter	Moder
	N3vBa	Branches	Moder
S6	S6G1	Grass	Mull
	S6G2	Grass	Amphi
	S6G3	Grass	Amphi
	S6vGa	Grass	Amphi
	S6L1	Litter	Mull
	S6L2	Litter	Mull
	S6L3	Litter	Mull
	S6vLa	Litter	Amphi
	S6B3	Branches	Amphi
	S6vBa	Branches	Mullmoder
S7	S7G1	Grass	Moder
	S7G2	Grass	Amphi
	S7G3	Grass	Amphi
	S7vGa	Grass	Mullmoder
	S7vGb	Grass	Mullmoder
	S7vLa	Litter	Amphi
	S7vLb	Litter	Mull
	S7vLc	Litter	Mullmoder
S8	S8G1	Grass/Moss	Moder
	S8G2	Grass/Moss	Mullmoder
	S8G3	Grass/Moss	Eroded Moder
	S8vGa	Grass/Moss	Moder
	S8vGb	Grass/Moss	Moder
	S8L1	Litter	Moder
	S8L2	Litter	Mullmoder
	S8L3	Litter	Mullmoder
	S8vLa	Litter	Eroded Moder
	S8vLb	Litter	Mullmoder
	S8vBa	Branches	Moder

**Table S3.** Predicted areas covered by humus form classes as derived from spatial models at the slope and landscape scale (in ha). Percentage values are given in brackets

<b>Humus form class</b>	<b>Slope scale, north-facing slope</b>	<b>Slope scale, south-facing slope</b>	<b>Landscape scale</b>
Moder	90.23 (24.8%)	141.96 (62.9%)	730.59 (4.0%)
Moder, partially eroded	9.64 (2.7%)	4.81 (2.1%)	117.45 (0.6%)
Moder, trend to Amphi	99.73 (27.5%)	63.60 (28.2%)	4689.93 (25.8%)
Mullmoder	116.66 (32.1%)	11.17 (4.9%)	12252.00 (67.4%)
Mullmoder, eroded	2.66 (0.7%)	< 0.01 (< 0.1%)	160.56 (0.9%)
Amphi	17.70 (4.9%)	3.99 (1.8%)	23.43 (0.1%)
Mull, trend to Amphi	20.61 (5.7%)	0.31 (0.1%)	96.97 (0.5%)
Mull	6.05 (1.7%)	-	101.57 (0.6%)
<b>Total area</b>	<b>363.28</b>	<b>225.84</b>	<b>18172.50</b>