SUPPLEMENTARY MATERIALS

Figure S1. The following image reports the localization of the study area (A) and the permanent plots (B) settled to collect data through the study period. A) yellow area indicates the surface interested by count surveys of the three ungulate species (ca. 527 km2).
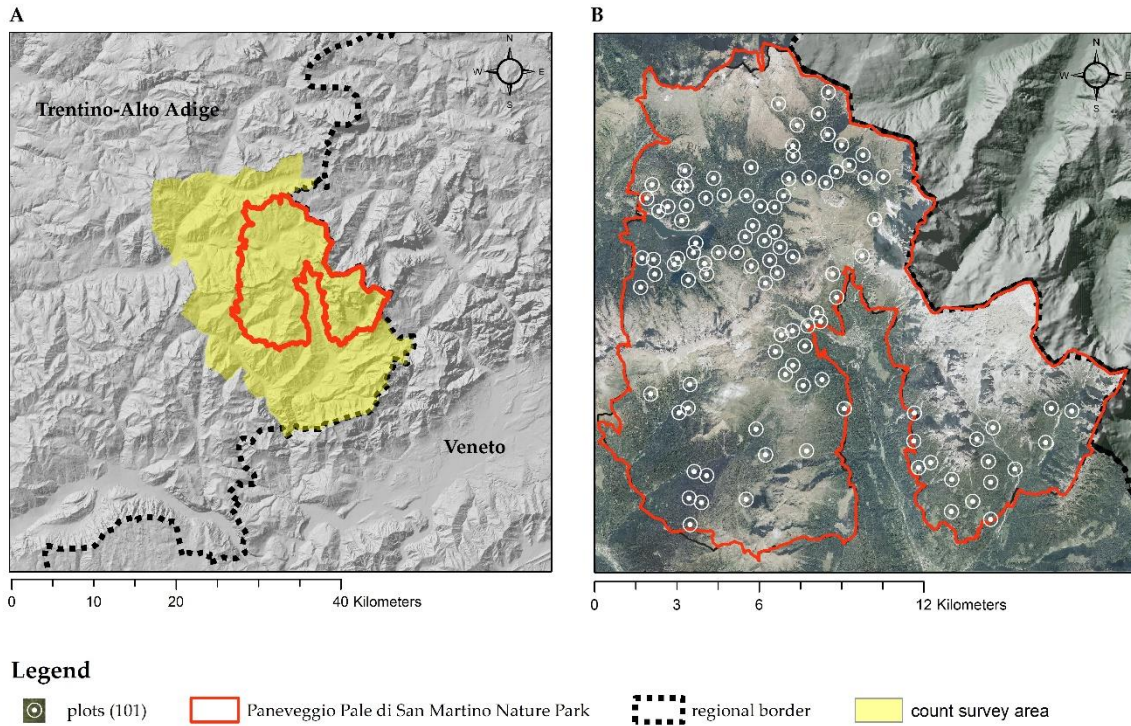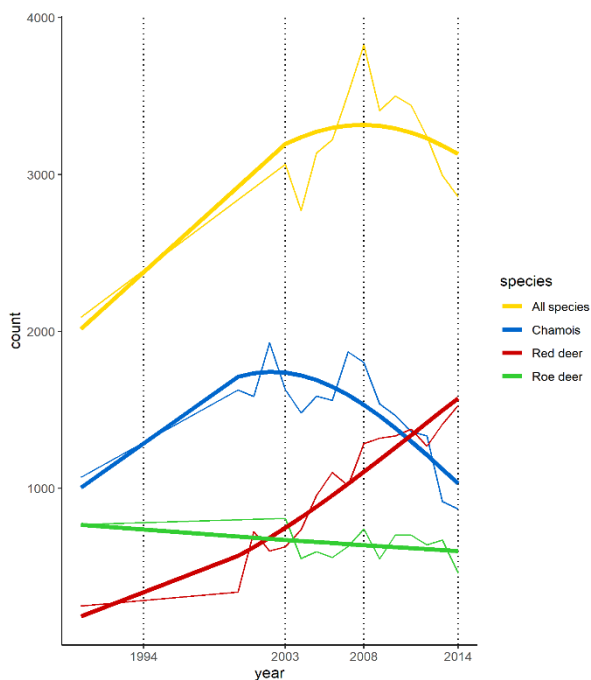

Legend

⊙ plots (101)   ▭ Paneveggio Pale di San Martino Nature Park   ⬚ regional border   ▭ count survey area

Figure S2. The following image reports the trends of chamois, red deer and roe deer population with their sum, obtained from the surveys conducted in the study area between 1990 and 2014. Vertical lines indicate the sampling times of young trees density and browsing pressure. In order to test the significance population trends, a Poisson GLM has been performed for each ungulate species and the relative results are reported in the table on the right.

	parameter	estimate	p-value
All species	(intercept)	-1.249e+04	<2e-16 ***
	year	6.232e+00	<2e-16 ***
	year²	-1.459e+02	<2e-16 ***
Chamois	(Intercept)	-3.001e+04	<2e-16 ***
	year	1.497e+01	<2e-16 ***
	year²	-3.514e+02	<2e-16 ***
Red deer	(Intercept)	-1.379e+04	3.53e-12 ***
	year	6.880e+00	3.44e-12 ***
	year²	-1.595e+02	5.91e-12 ***
Roe deer	(Intercept)	27.014632	1.52e-14 ***
	year	-0.010238	5.08e-09 ***

Table S1. The following table summarizes the effects size, the standard errors and p-values for all the variables that have been considered in modeling the browsing probability of a plant in size classes A and B.

Size class	Variable	Estimate	S.E.	p
A	*Abies*	1.10	0.35	0.00
	Fagus	3.10	0.63	0.00
	Larix	0.34	0.37	0.35
	Other broadleaves	2.14	0.36	0.00
	Pinus	-0.84	0.53	0.11
	Sorbus	1.66	0.11	0.00
	Elevation	-0.07	0.04	0.09
	Slope	0.01	0.05	0.88
	Aspect	0.02	0.04	0.71
	Distance from open areas	-0.06	0.04	0.20
	Tree density	-0.07	0.05	0.17
	Basal area	0.22	0.06	0.00
	% broadleaves	-0.24	0.10	0.01
B	*Abies*	1.34	0.26	0.00
	Fagus	2.20	0.34	0.00
	Larix	0.06	0.19	0.74
	Other broadleaves	1.72	0.27	0.00
	Pinus	-1.12	0.43	0.01
	Sorbus	2.54	0.14	0.00
	Elevation	0.02	0.05	0.65
	Slope	-0.05	0.05	0.33
	Aspect	0.28	0.06	0.00
	Distance from open areas	0.07	0.05	0.16
	Tree density	-0.31	0.07	0.00
	Basal area	0.24	0.08	0.00
	% broadleaves	-0.05	0.06	0.37

Figure S3. This panel reports the Shepard diagrams for the nonmetric multidimensional scaling (nMDS) result of each size class. The nonmetric fit is based on stress S and defined as R2 = 1-S*S. The "linear fit" is the squared correlation between fitted values and ordination distances.
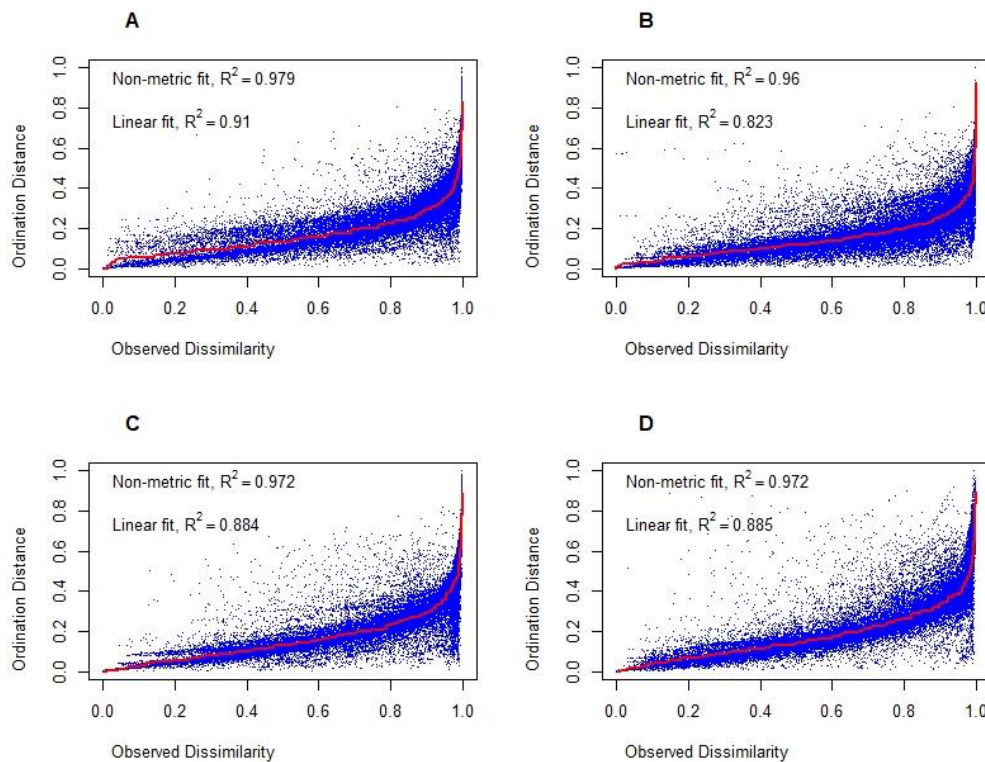
Table S2. The following table reports the average density of plants species within each size class, subdivided per years. Averages shown in this table have been calculated only for plots where the relative species has been found, then plots with no plants of that species where excluded from the analysis. Standard deviation is reported in parentheses as a measure of dispersion.

Species	Size class	1994	2003	2008	2014
Stone Pine	A	74 (121)	304 (288)	164 (140)	203 (283)
	B	180 (144)	178 (196)	160 (171)	223 (379)
	C	76 (95)	102 (85)	69 (72)	54 (41)
	D	94 (107)	119 (156)	75 (101)	109 (157)
Norway spruce	A	454 (1152)	724 (1487)	624 (1479)	557 (1212)
	B	981 (3304)	781 (1708)	850 (2934)	475 (1248)
	C	434 (1450)	559 (1591)	509 (1678)	294 (526)
	D	464 (1428)	575 (1669)	559 (1118)	405 (809)
European larch	A	165 (300)	144 (176)	396 (914)	417 (890)
	B	136 (132)	162 (228)	382 (1414)	692 (2176)
	C	168 (304)	111 (124)	106 (136)	209 (436)
	D	110 (115)	111 (128)	86 (97)	134 (149)
Silver fir	A	229 (200)	214 (234)	211 (190)	137 (125)
	B	185 (226)	111 (75)	184 (95)	272 (275)
	C	100 (80)	46 (28)	127 (NA)	84 (66)
	D	135 (173)	130 (181)	407 (719)	235 (251)
European beech	A	59 (36)	302 (277)	57 (39)	97 (59)
	B	91 (64)	106 (70)	113 (59)	74 (51)
	C	170 (128)	583 (1171)	91 (56)	177 (121)
	D	108 (98)	217 (135)	154 (165)	116 (61)
European rowan	A	384 (601)	1886 (3523)	1577 (3017)	1937 (4925)
	B	275 (456)	371 (873)	259 (336)	282 (486)
	C	77 (81)	131 (147)	128 (108)	132 (141)
	D	92 (144)	130 (149)	155 (192)	80 (129)
ssp	A	281 (350)	160 (165)	255 (479)	290 (525)
	B	703 (1717)	245 (218)	385 (438)	77 (73)
	C	119 (153)	219 (246)	202 (199)	94 (78)
	D	197 (194)	209 (209)	146 (116)	152 (194)

Figure S4. This chart reports the average depth of the snowpack measured by five weather stations (Calaita station = 1605 m a.s.l., San Martino di Castrozza station = 1450 m a.s.l., Rolle station = 2012 m a.s.l., Paneveggio station = 1540 m a.s.l., Tonadico station = 1045 m a.s.l.) between 10/31/2008 and 05/25/2014. Data are available at https://www.meteotrentino.it .