

Supplementary Materials

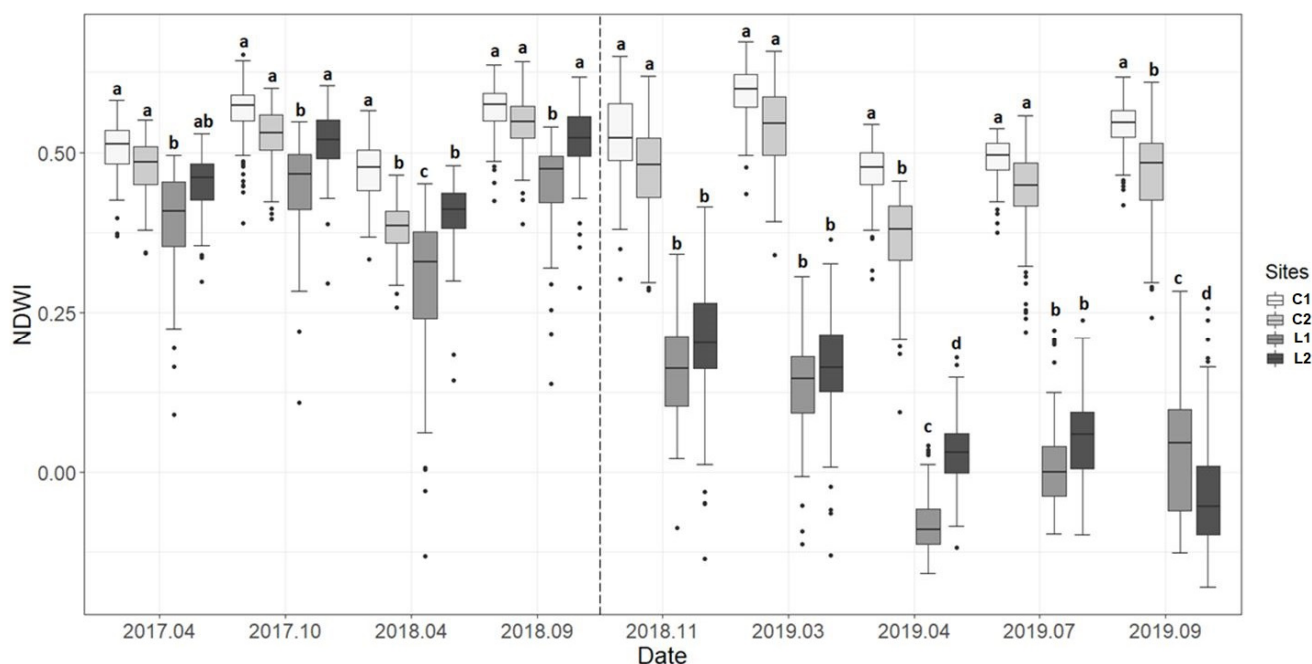


Figure S1. Median values, 25th and 75th percentiles of Normalized Difference Water Index (NDWI) temporal profiles for control (C1 and C2) and study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p-value < 0.05). The dash line separates pre and post-Vaia dates.

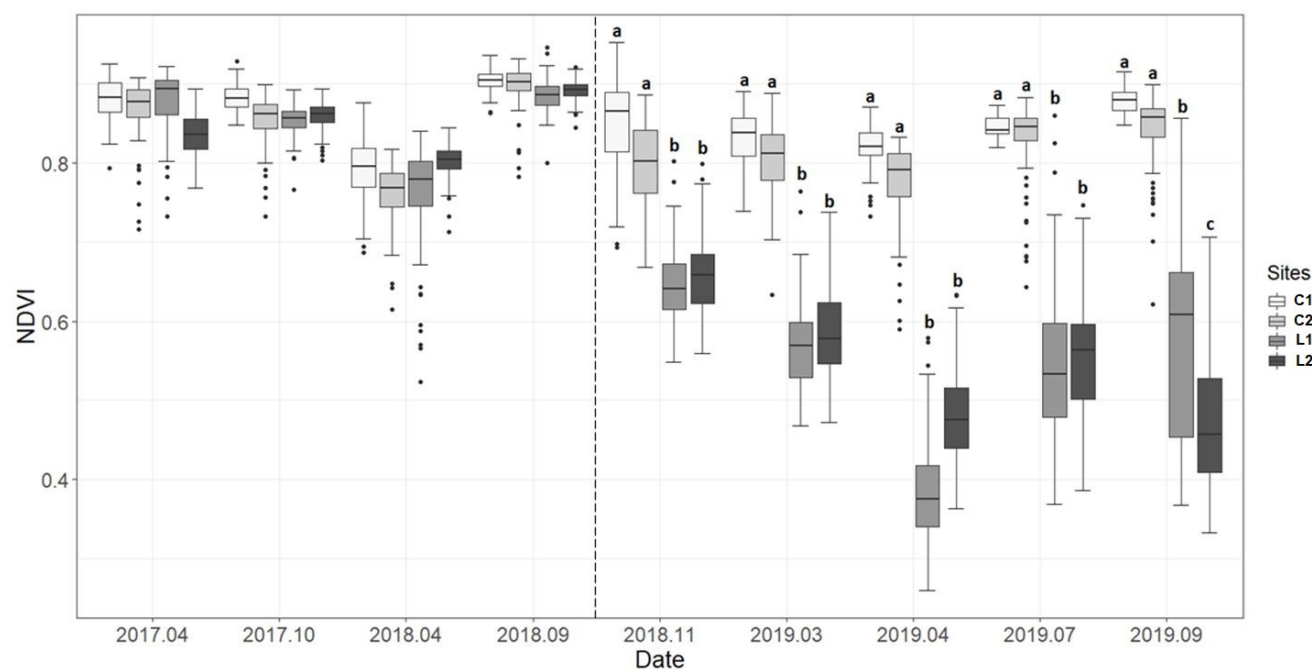


Figure S2. Median values, 25th and 75th percentiles of Normalized Difference Vegetation Index (NDVI) temporal profiles for control (C1 and C2) and study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p-value < 0.05). The dash line separates pre and post-Vaia dates.

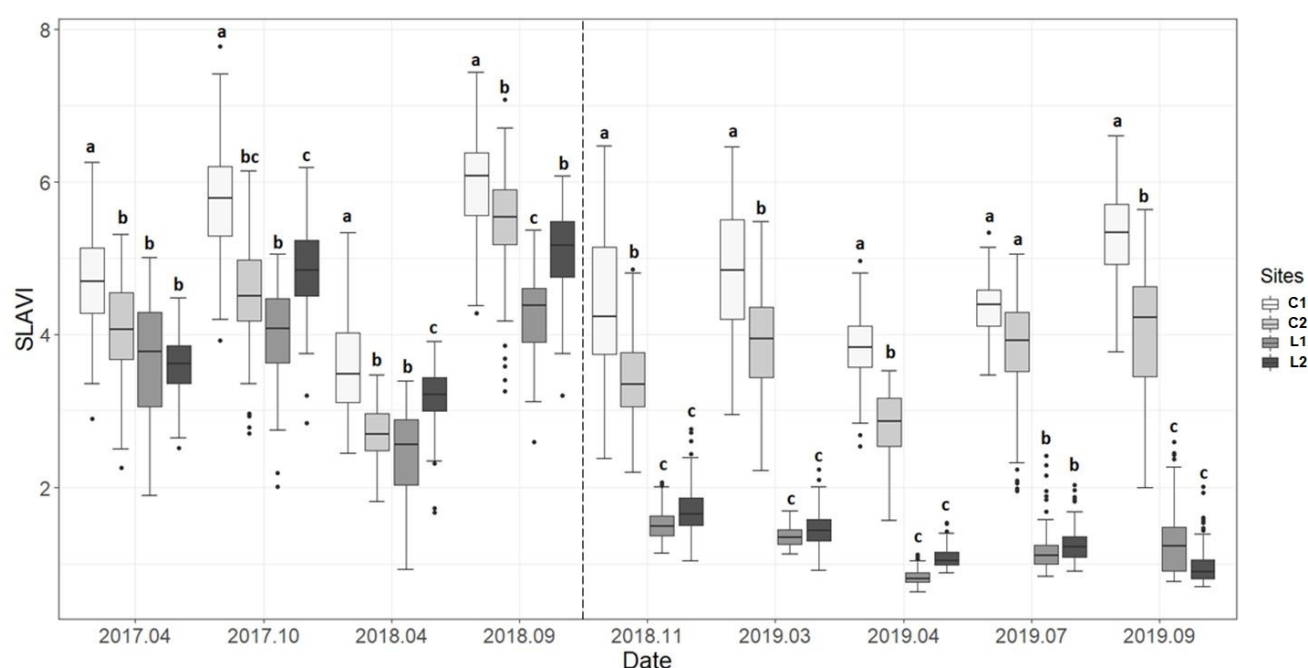


Figure S3. Median values, 25th and 75th percentiles of Specific Leaf Area Vegetation Index (SLAVI) temporal profiles for control (C1 and C2) and study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p -value < 0.05). The dash line separates pre and post-Vaia dates.

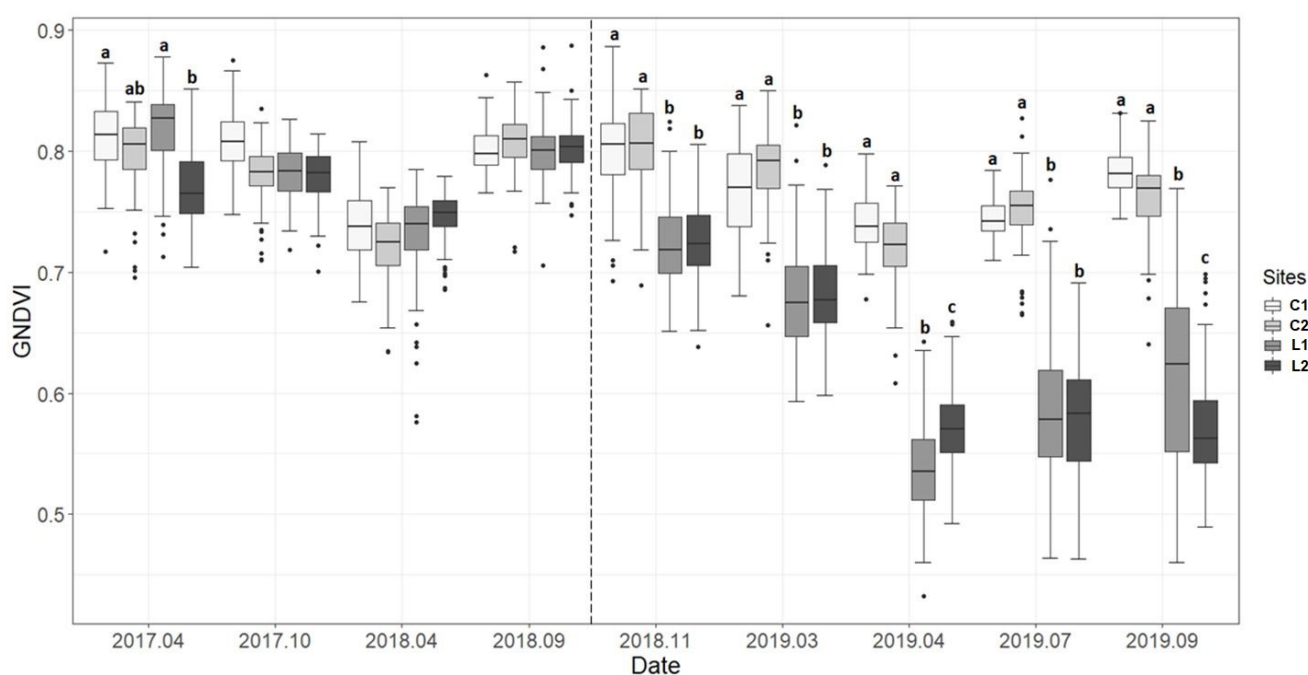


Figure S4. Median values, 25th and 75th percentiles of Green Normalized Difference Vegetation Index (GNDVI) temporal profiles for control (C1 and C2) and study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p -value < 0.05). The dash line separates pre and post-Vaia dates.

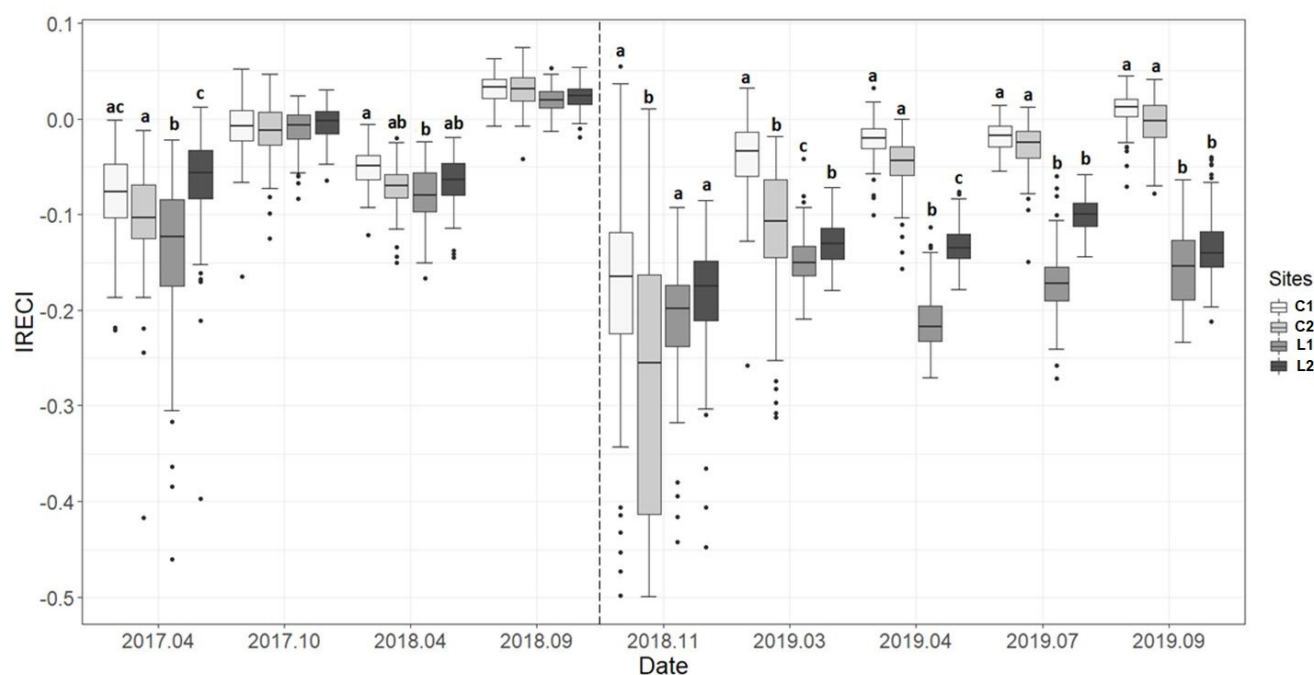


Figure S5. Median values, 25th and 75th percentiles of Inverted Red-Edge Chlorophyll Index (IRECI) temporal profiles for control (C1 and C2) and study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p-value < 0.05). The dash line separates pre and post-Vaia dates.

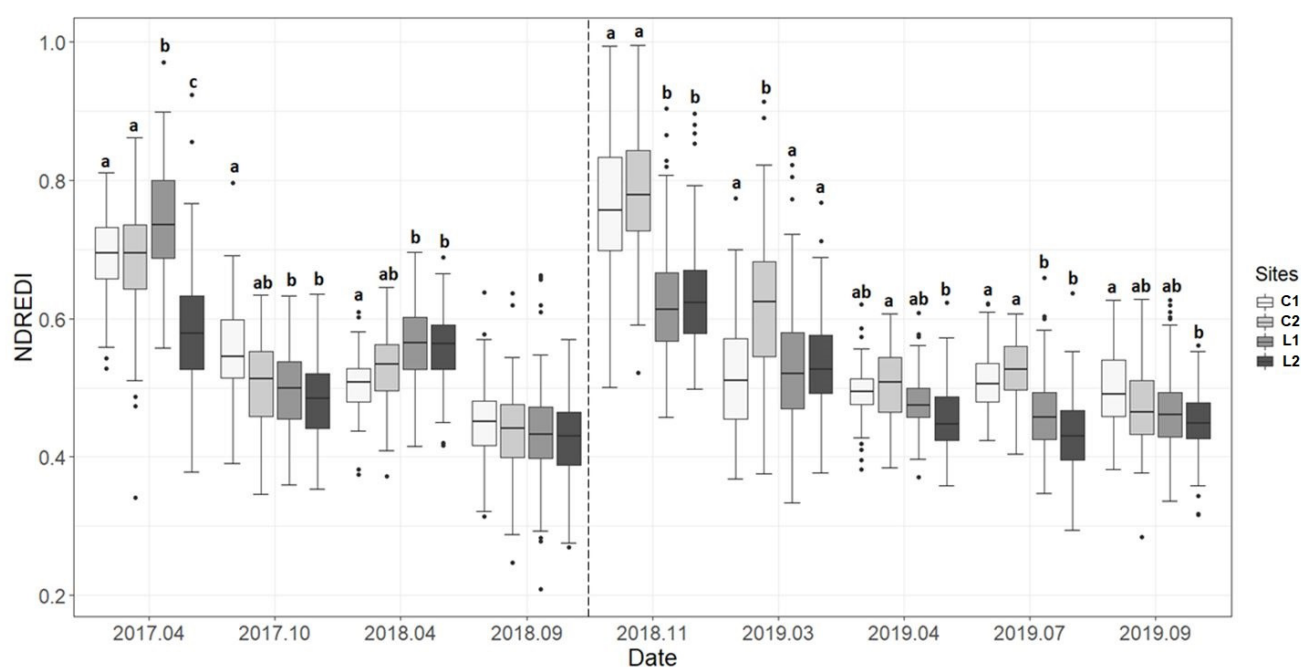
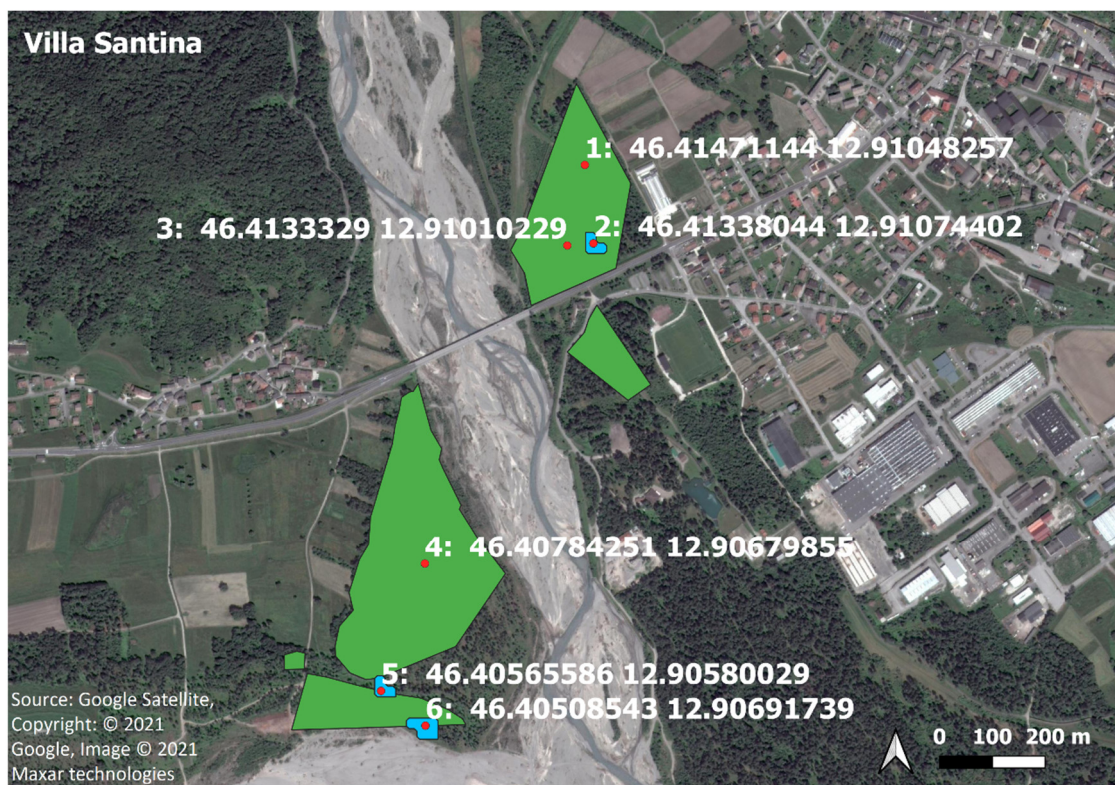
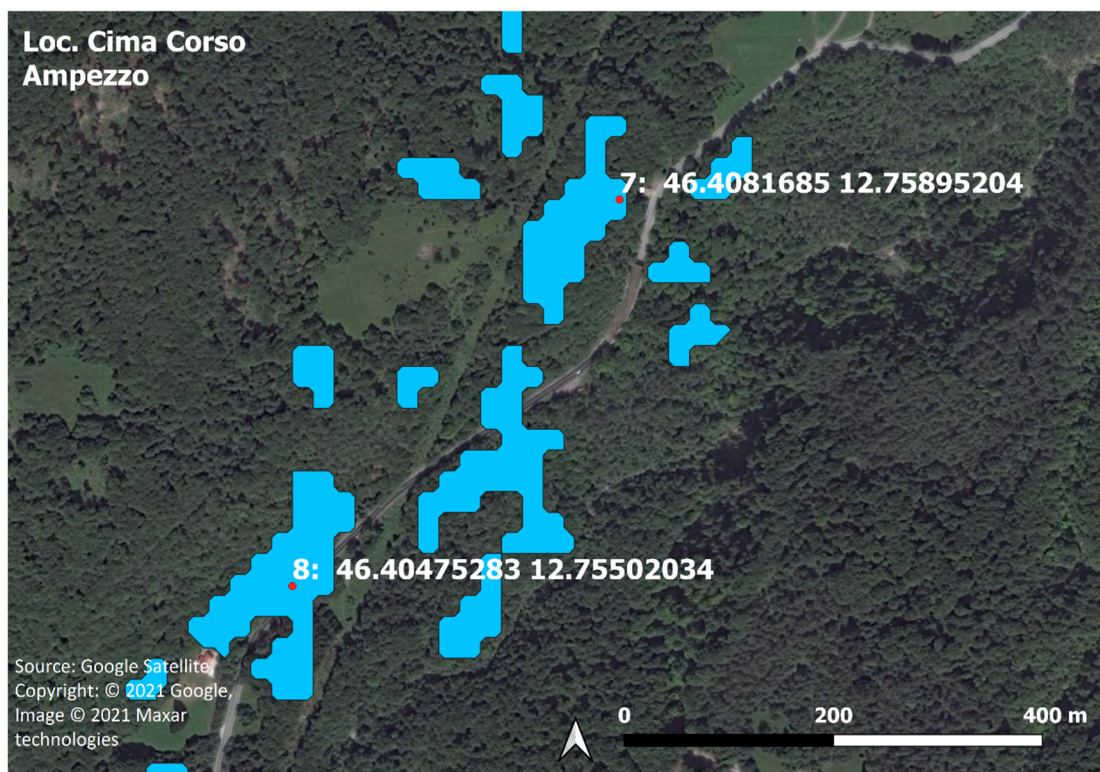


Figure S6. Median values, 25th and 75th percentiles of Normalized Difference Red-Edge Blue Index (NDREDI) temporal profiles for control (C1 and C2) and damaged study sites (L1, L2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019). Letters denote statistical significance between control and wind-damaged sites index values (p-value < 0.05). The dash line separates pre and post-Vaia dates.

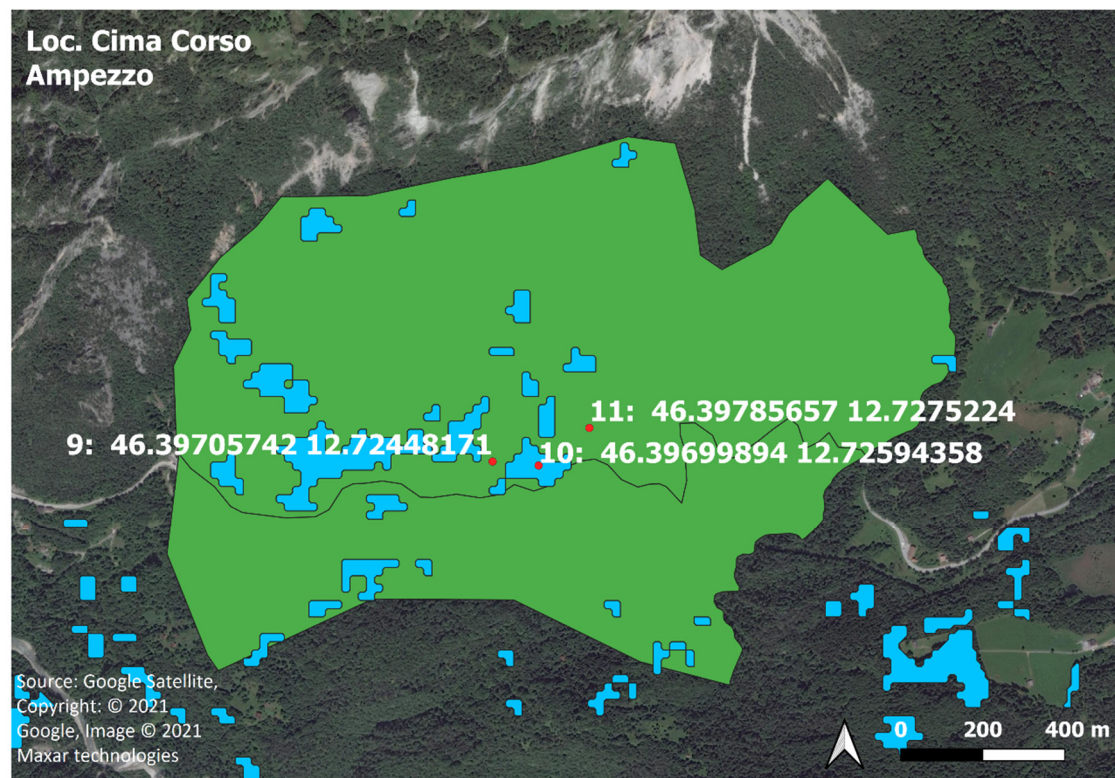




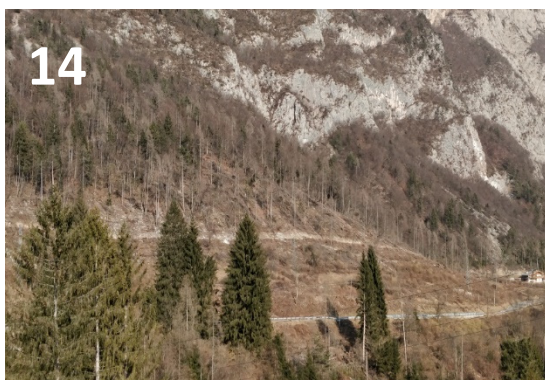
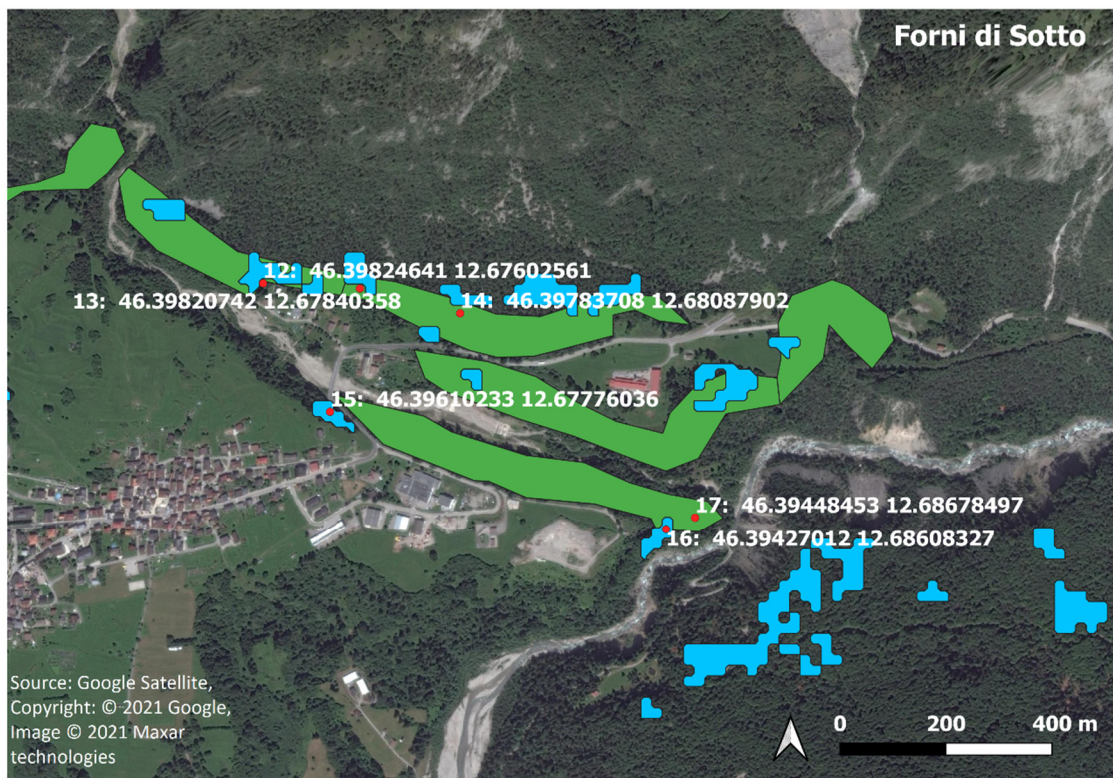
(a)



(b).

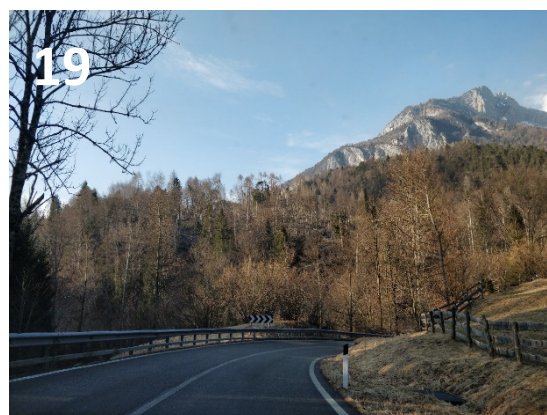
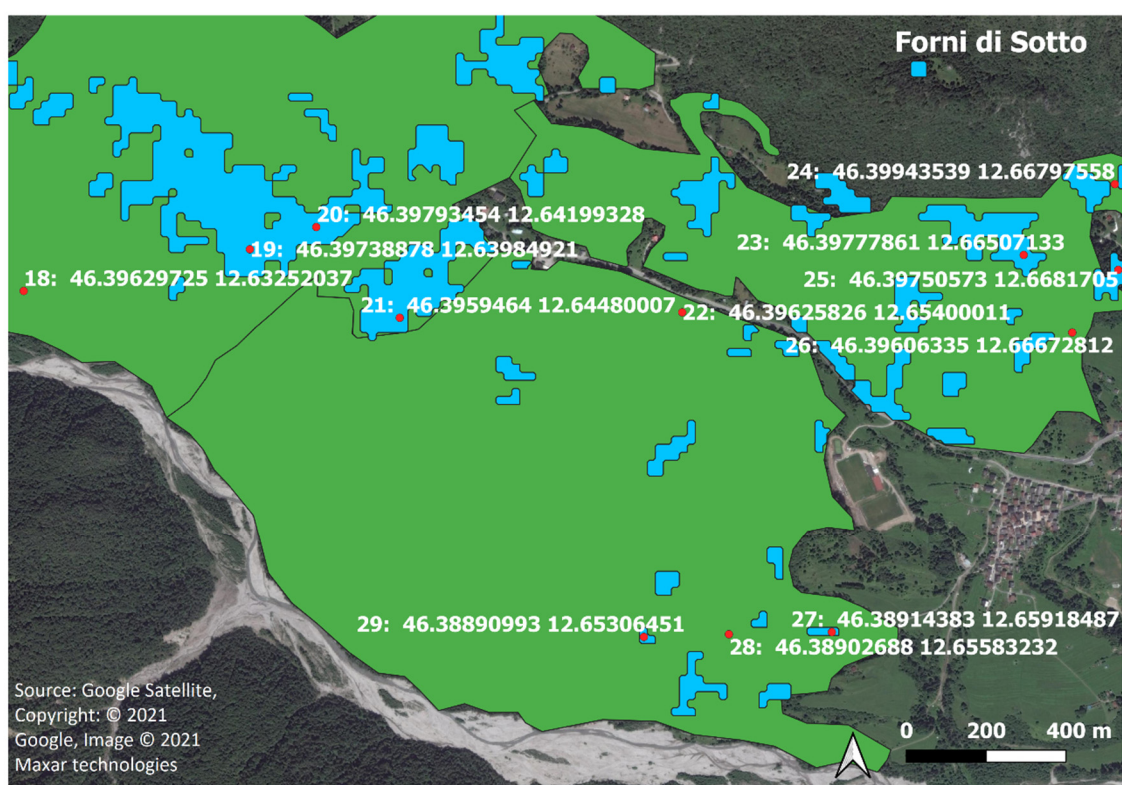


(c).





(d).







(e).

Figure S7. The images below show the areas visited during the field survey of the 1st of February 2020 in Tagliamento Valley, from the municipality of Villa Santina to Forni di Sotto, where, according to RFS, most damages were registered. Images points coordinates (in red) are provided in decimal degrees. Such areas include: (a) Villa Santina municipality, (b,c) Ampezzo and (d,e) Forni di Sotto. The Friuli Venezia Giulia windthrown areas, obtained through NDWI8A VID technique, are shown in blue while the ones provided by the Regional Forest Service (RFS) are in green.

Table S1. Outputs of Generalized Least Square models testing differences of NDWI8A, NDWI, NDVI, PSRI, SLAVI, GNDVI, IRECI and NDREDI indices values between study sites (L1, L2, C1, C2) for each of the dates (April 2017, October 2017, April 2018, October 2018, November 2018, March 2019, April 2019, July 2019, September 2019).

	Band	Chisq	Df	P-value	Pseudo R ²
NDWI8A	Intercept	2358.880	1	< 2.2e-16	0.940
	Area	50.572	3	6.035 e-11	
	Date	175.376	8	< 2.2e-16	
	Area* Date	2695.089	24	< 2.2e-16	
NDWI	Intercept	1835.389	1	< 2.2e-16	0.901
	Area	49.797	3	8.825 e-11	
	Date	122.762	8	< 2.2e-16	
	Area* Date	2292.141	24	< 2.2e-16	
NDVI	Intercept	8156.732	1	< 2.2e-16	0.887
	Area	17.113	3	0.00067	
	Date	114.602	8	< 2.2e-16	
	Area* Date	2119.628	24	< 2.2e-16	
PSRI	Intercept	28.7703	1	8.149 e-08	0.862
	Area	3.7692	3	0.2875	
	Date	206.1174	8	< 2.2e-16	
	Area* Date	2421.4917	24	< 2.2e-16	
SLAVI	Intercept	2158.899	1	< 2.2e-16	0.885
	Area	80.572	3	< 2.2e-16	
	Date	557.458	8	< 2.2e-16	
	Area* Date	1203.149	24	< 2.2e-16	
GNDVI	Intercept	21117.447	1	< 2.2e-16	0.845
	Area	48.702	3	1.51 e-10	
	Date	236.272	8	< 2.2e-16	
	Area* Date	1770.065	24	< 2.2e-16	
IRECI	Intercept	230.59	1	< 2.2e-16	0.759
	Area	121.23	3	< 2.2e-16	
	Date	1002.96	8	< 2.2e-16	
	Area* Date	1580.13	24	< 2.2e-16	

NDREDI	Intercept	6042.00	1	< 2.2e-16	0.660
	Area	181.30	3	< 2.2e-16	
	Date	1091.29	8	< 2.2e-16	
	Area* Date	497.01	24	< 2.2e-16	

Table S2. Outputs of Generalized Least Square models testing differences of Sentinel-2 B02, B03, B04, B05, B06, B07, B08, B8A, B11, B12 values between study types (control vs windthrown) per each date after Vaia (October 2018, March 2019, April 2019, July 2019, September 2019).

	Band	Chisq	Df	P-value	Pseudo R²
B02	Intercept	28.021	1	1.200e-07	0.825
	Treatment	42.680	1	6.447e-11	
	Date	115.934	4	< 2.2e-16	
	Treatment* Date	218.069	4	< 2.2e-16	
B03	Intercept	169.450	1	< 2e-16	0.803
	Treatment	21.098	1	4.364 e-06	
	Date	68.009	4	5.972 e-14	
	Treatment* Date	221.572	4	< 2e-16	
B04	Intercept	46.6449	1	8.509 e-12	0.781
	Treatment	34.1556	1	5.088 e-09	
	Date	8.2756	4	0.08199	
	Treatment* Date	163.5031	4	< 2e-16	
B05	Intercept	163.132	1	< 2e-16	0.806
	Treatment	24.793	1	6.382 e-07	
	Date	26.331	4	2.713 e-05	
	Treatment* Date	129.901	4	< 2e-16	
B06	Intercept	403.925	1	< 2e-16	0.573
	Treatment	0.429	1	0.5125	
	Date	39.171	4	6.423 e-08	
	Treatment* Date	38.799	4	7.665 e-08	
B07	Intercept	489.0258	1	< 2.2e-16	0.542
	Treatment	0.9067	1	0.341	
	Date	44.5888	4	4.841 e-09	
	Treatment* Date	27.8879	4	1.314 e-05	
B08	Intercept	655.6683	1	< 2.2e-1	0.455
	Treatment	0.4409	1	0.5067	
	Date	41.3361	4	2.290 e-08	
	Treatment* Date	33.7245	4	8.487 e-07	
B8A	Intercept	543.0829	1	< 2.2e-1	0.550
	Treatment	0.0128	1	0.9099	
	Date	41.0014	4	2.686 e-08	
	Treatment* Date	29.7851	4	5.413 e-06	
B11	Intercept	47.310	1	6.060 e-12	0.825
	Treatment	25.702	1	3.984 e-07	
	Date	19.494	4	0.0006283	
	Treatment* Date	96.606	4	< 2.2e-16	
B12	Intercept	24.299	1	8.248 e-07	0.807
	Treatment	25.057	1	5.566 e-07	
	Date	11.340	4	0.02299	
	Treatment* Date	70.845	4	1.505 e-14	

Table S3. NDWI8A VID and RFS estimations in RFS delimited areas and NDWI8A VID % error as compared to RFS estimations for each municipality.

Municipality	RFS Estimation ha	NDWI8A VID Estimation ha	% Error
Ampezzo	105.51	49.25	36.35
Arta Terme	23.43	4.98	64.96
Cervineto	34.85	8.64	60.28
Chiusaforte	8.21	0.01	99.82
Comeglians	25.91	4.05	72.97
Enemonzo	11.41	0.12	97.90
Forni Avoltri	547.21	175.60	51.41
Forni di Sotto	691.18	55.68	85.09
Lauco	33.77	2.01	88.79
Malborghetto Valbruna	218.43	4.11	96.31
Moggio Udinese	31.14	1.87	88.68
Ovaro	112.86	41.82	45.93
Paluzza	212.17	79.19	45.64
Paularo	138.71	20.29	74.48
Pontebba	51.51	13.78	57.78
Prato Carnico	87.16	14.34	71.75
Preone	12.16	1.72	75.16
Ravascletto	27.58	11.24	42.11
Resia	9.43	1.90	66.44
Rigolato	150.93	42.09	56.39
Sauris	32.58	13.03	42.85
Socchieve	19.33	6.46	49.88
Sutrio	180.29	69.44	44.39
Tarvisio	148.40	1.47	98.04
Tolmezzo	5.33	8.33	80.72
Tramonti di Sopra	51.80	0.24	91.49
Treppo Ligosullo	6.40	6.47	77.79
Venzone	54.06	4.48	17.64
Verzegnis	6.49	12.49	62.45
Villa Santina	6.48	0.11	96.50
Zuglio	41.69	6.04	74.67
TOTAL	3183.15	661.26	65.60