Table S1

Mean species richness and associated standard deviation (SP(SD)) of each biome and year of sampling.

Biome	Year	SP (SD)
Boreal	1999	38.2 (18.4)
	2000	44 (14.1)
	2001	45.5 (10.6)
	2002	44.5 (14.8)
	2003	44.5 (19.1)
	2004	43 (15.6)
	2005	43.3 (19.9)
	2006	57 (29.1)
	2007	28
	2008	40 (18.4)
	2009	54.8 (24.9)
	2010	30.5 (6.4)
	2011	47.4 (25.2)
	2012	49.3 (27)
	2013	27.5 (20.5)
	2014	26.5 (21.9)
	2023	46
Nemoral_oak	1999	52.4 (16.7)
	2000	50.2 (9.5)
	2001	52.8 (7.3)
	2002	50.8 (7.9)
	2003	47.8 (15.1)
	2004	49.5 (13.5)
	2005	53.2 (16.1)
	2006	42.3 (16.8)
	2007	47 (11.6)
	2008	45.5 (12.6)
	2009	42.4 (16.1)
	2010	55.4 (20.3)
	2011	46 (17.7)

	2012	43.6 (17.8)
	2013	31.2 (14.3)
	2014	30 (15.2)
	2016	33 (15.7)
	2019	34.5 (13.4)
	2020	31.3 (12.7)
	2023	28.7 (11.5)
Nemoral_beech	1999	27.3 (6.7)
	2000	28.5 (4.2)
	2001	29.8 (5.4)
	2002	31.5 (6.4)
	2003	29.8 (7.7)
	2004	32.5 (8.3)
	2005	26.9 (9.7)
	2006	33 (8.5)
	2007	28 (7.9)
	2008	25.5 (8.2)
	2009	24.4 (9.5)
	2010	23.2 (9.4)
	2011	23.9 (9.6)
	2012	23.2 (9.7)
	2013	17.6 (5.5)
	2014	17.6 (7.7)
	2016	25 (10.4)
	2019	23.2 (11.6)
	2020	24 (11)
	2023	20 (9.6)
Mediterranean	1999	23.5 (10.6)
	2000	26
	2001	29
	2002	26.5 (3.5)
	2003	27
	2004	28
	2005	21.8 (5.6)

	2006	25 (4.2)
	2008	25
	2009	24 (2.8)
	2010	21 (1.4)
	2011	20.5 (7.5)
	2012	18 (3.6)
	2013	16
	2014	17
	2023	20

Table S2

Results of the linear mixed models (LMM) on the temporal trends in species richness from 1999 to 2023, by biome.

Biome	Estimate	Std. Error	df	t value	Pr(>|t|)	Sign
Boreal	-0.69	0.23	41	-3.00	<0.01	**
Nemoral oak	-0.34	0.08	84.37	-4.12	<0.001	***
Nemoral beech	-0.20	0.06	89.41	-3.56	<0.001	***
Mediterranean	0.04	0.11	240.23	0.33	0.74	NS

Results of the LMMs on the temporal trends in species richness from 1999 to 2014, by biome.

Biome	Estimate	Std. Error	df	t value	Pr(>|t|)	Sign
Boreal	-0.37	0.10	40.68	-3.74	<0.001	***
Nemoral oak	-0.69	0.14	74.20	-5.01	<0.001	***
Nemoral beech	-0.38	0.10	73.85	-4.01	<0.001	***
Mediterranean	-0.06	0.13	22.95	-0.50	0.62	NS

Table S3

Results of the LMM on the temporal trends in canopy cover from 1999 to 2023 for the Boreal biome.

	Estimate	Std. Error	df	t value	Pr(>|t|)	Sign
Year	1.59	0.22	43.19	7.33	<0.001	***

Table S4

Result of LMMs on temporal trends (1999–2023) in the unweighted mean of Ellenberg indicator values (light, moisture, and temperature) specific to the Italian flora (Tichý et al., 2023). Only statistically significant results are reported separately by biome.

Biome	Light	Moisture	Temperature
Boreal	-0.03 (***)		
Nemoral oak		-0.004 (*)	0.01 (***)

Table S5

Results of the LMM on the temporal trends in canopy cover from 1999 to 2023 for the Mediterranean biome.

	Estimate	Std. Error	df	t value	Pr(>|t|)	Sign
Year	0.25	0.35	26.41	0.69	0.49	NS

Table S6

Results of Spearman's rank correlation analysis among soil variables.

	pH	NH_4^+	SO_4^{2-}	K	NO_3^-
pH	1	-0.316	-0.128	-0.03	-0.206
NH_4^+	-0.316	1	0.332	0.29	0.126
SO_4^{2-}	-0.128	0.332	1	0.266	0.164
K	-0.03	0.29	0.266	1	-0.051
NO_3^-	-0.206	0.126	0.164	-0.051	1

Table S7

Spatial autocorrelation of model residuals assessed by Moran's *I* for the baseline year (1999). These results refer to the models analysing species richness over time. The table reports Moran's *I* and p-value. Spatial contiguity was defined using a maximum neighbor distance of 300 km between plots (i.e., the minimum distance required to ensure at least three spatially connected plots/sites for the computation of Moran's I). In the Mediterranean biome the inter-site distances were larger than 300 km, so Moran's I could not be computed there.

	I	Pr
Boreal	-0.50	0.61

Nemoral beech	-1.62	0.95
Nemoral oak	-0.27	0.14
Mediterranean	-	-

Table S8

Temporal autocorrelation of model residuals assessed by the Mantel test. The Mantel statistic *r* was computed between the distance matrix of residuals and the temporal distance matrix (years). The table reports *r* and significance (Pr).

Biome	Predictor variables	Mantel r	Pr
Boreal	Year	0.19	0.02
	Forest structure	0.11	0.05
	Immediate Turnover	-0.03	0.63
Nemoral beech	Year	0.01	0.41
	Climate	0.15	0.001
	Forest structure	0.03	0.28
	Soil	-0.03	0.61
	Cumulative Turnover	0.02	0.31
	Cumulative Nestedness	-0.03	0.73
Nemoral oak	Year	-0.07	0.93
	Climate	0.02	0.31
	Forest structure	0.02	0.30
	Cumulative Turnover	0.08	0.09
	Immediate Nestedness	-0.01	0.53
Mediterranean	Climate	0.10	0.13
	Immediate Turnover	-0.10	0.86