

Long-term patterns and mechanisms of plant invasions in forests: the role of forest age and land-use history

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S1 Relationships among variables

Table S1.1. Correlation matrix with plot variables from 1952-2022 used in models to predict whether a plot was newly colonized or never colonized. Numbers represent Pearson correlation coefficients calculated using the *Hmisc* package in R. Correlations with the distances of plots to the nearest individual of each species in each year are not reported. Older PA=older post-agricultural, Younger PA = younger post-agricultural.

	Older PA	Younger PA	Distance to Edge	Richness*	Basal Area*
Transition	1	-0.2	-0.17	-	-
Open	-0.2	1	-0.46	-	-
Distance to Edge	-0.17	-0.46	1	-	-
Richness 1952	0.38	0.28	-0.34	-	-0.33
Richness 1962	0.4	0.35	-0.31	-	-0.28
Richness 1972	0.4	0.36	-0.32	-	-0.21
Richness 1982	0.46	0.44	-0.39	-	-0.27
Richness 1992	0.34	0.53	-0.4	-	-0.1
Richness 2002	0.27	0.55	-0.43	-	-0.17
Richness 2012	0.18	0.47	-0.31	-	-0.15
Richness 2022	0.2	0.44	-0.3	-	n/a
Basal Area 1952	-0.09	-0.43	0.36	n/a	-
Basal Area 1962	-0.11	-0.48	0.33	-0.33	-
Basal Area 1972	-0.06	-0.42	0.28	-0.28	-
Basal Area 1982	-0.11	-0.28	0.16	-0.21	-
Basal Area 1992	-0.16	-0.27	0.15	-0.27	-
Basal Area 2002	-0.05	-0.19	0.22	-0.1	-
Basal Area 2012	-0.01	-0.2	0.27	-0.17	-
Basal Area 2022	-0.02	-0.13	0.21	-0.15	-

*correlations in these columns are between the year indicated in the row heading and the corresponding year for the other variable. E.g., Basal area in 1962 corresponds with richness in 1952.

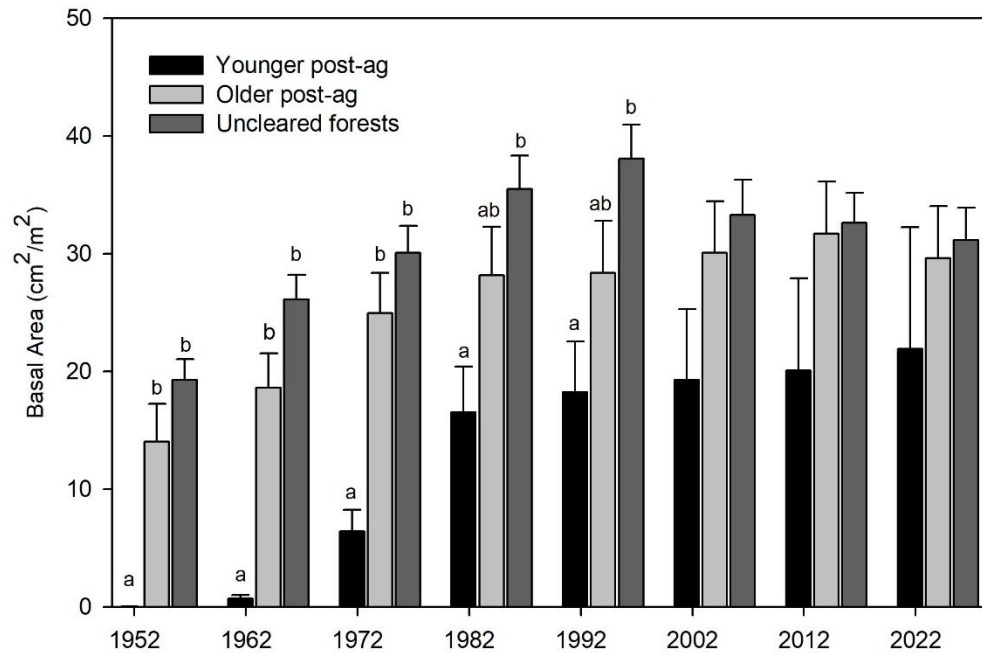


Figure S1.1. Basal area in plots in different land-use history classes. Bars show means $\pm$ SE. $n = 86$ for younger post-agricultural, $n = 180$ for older post-agricultural, $n = 484$ for uncleared forest.

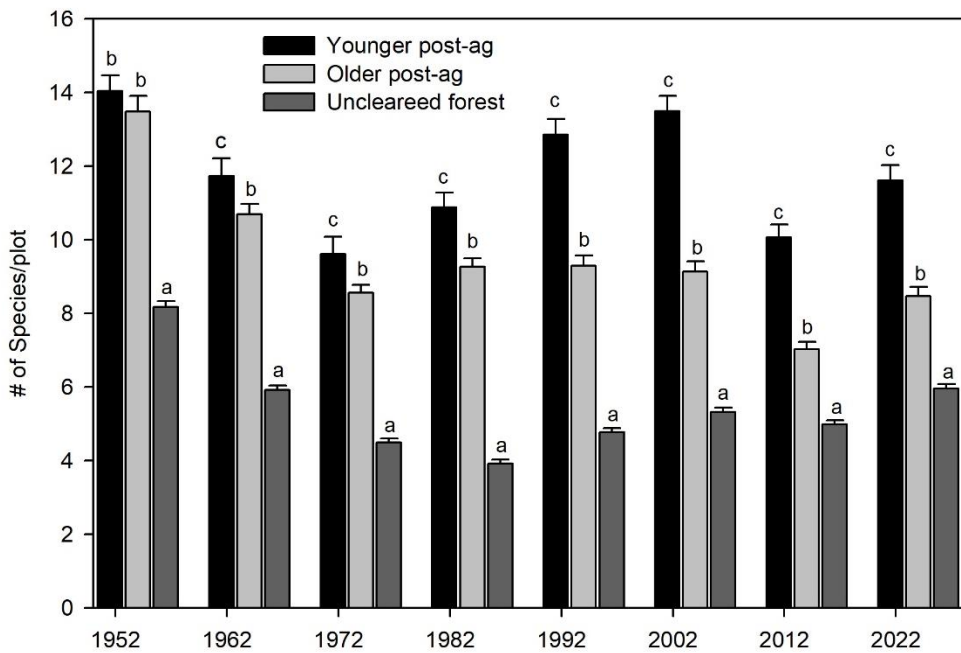


Figure S1.2. Species richness in plots in different land-use history classes. Bars show means $\pm$ SE. $n = 86$ for younger post-agricultural, $n = 180$ for older post-agricultural, $n = 484$ for uncleared forest.

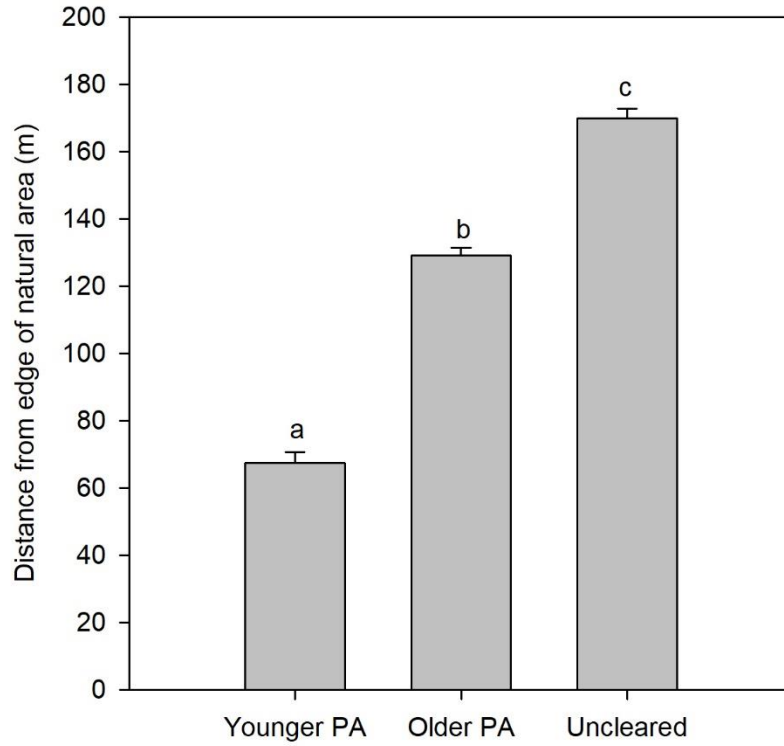


Figure S1.3. Distance to the edge of the natural area in plots in different land-use history classes. PA indicates post-agricultural. Bars show means $\pm$ SE. $n = 86$ for younger post-agricultural, $n = 180$ for older post-agricultural, $n = 484$ for uncleared forest.

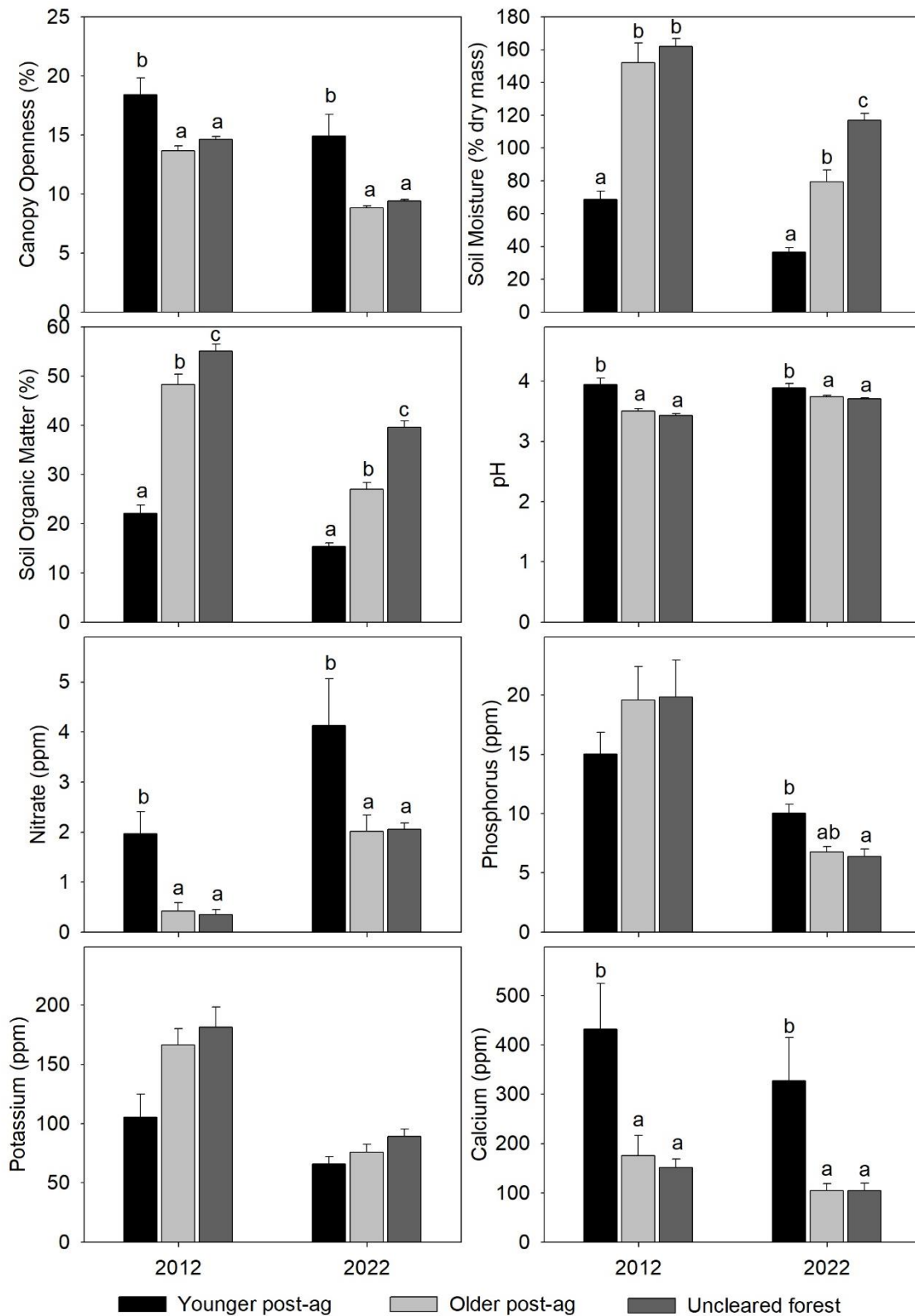


Figure S1.4. Differences by land-use history classes of variables measured only in 2012 and 2022. Bars show means $\pm$ SE. $n = 86$ for younger post-agricultural, $n = 180$ for older post-agricultural, $n = 484$ for uncleared forest.

S2 Number of newly colonized plots over time for each species

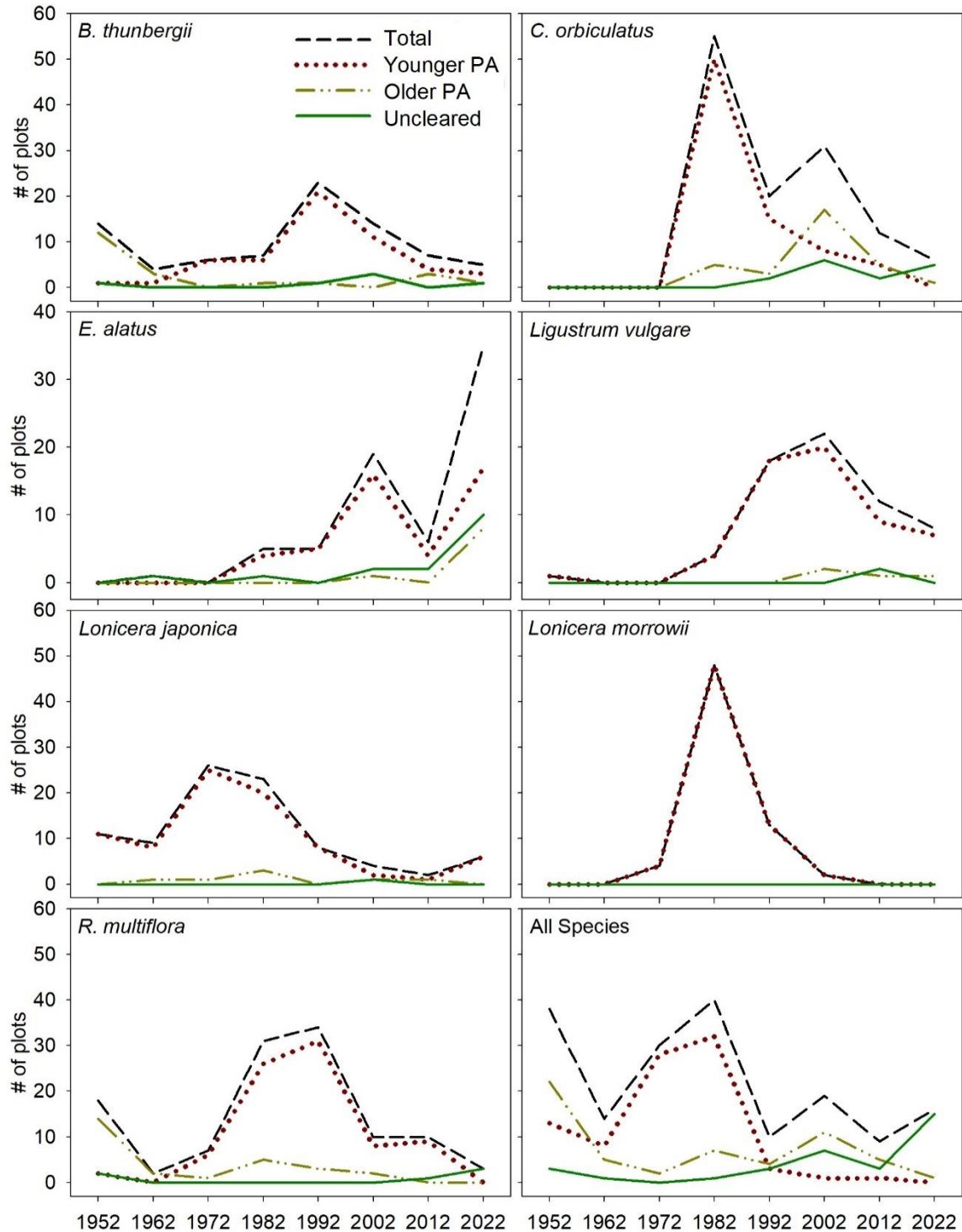


Figure S2. Number of newly colonized plots by year and initial land cover. Newly colonized plots are plots where the species is found in the given year but was not present in any prior survey. For all species, newly colonized plots have had no invasive species in the plot previously. PA indicates post-agricultural sites

S3 Colonization distance from the edge of the natural area over time

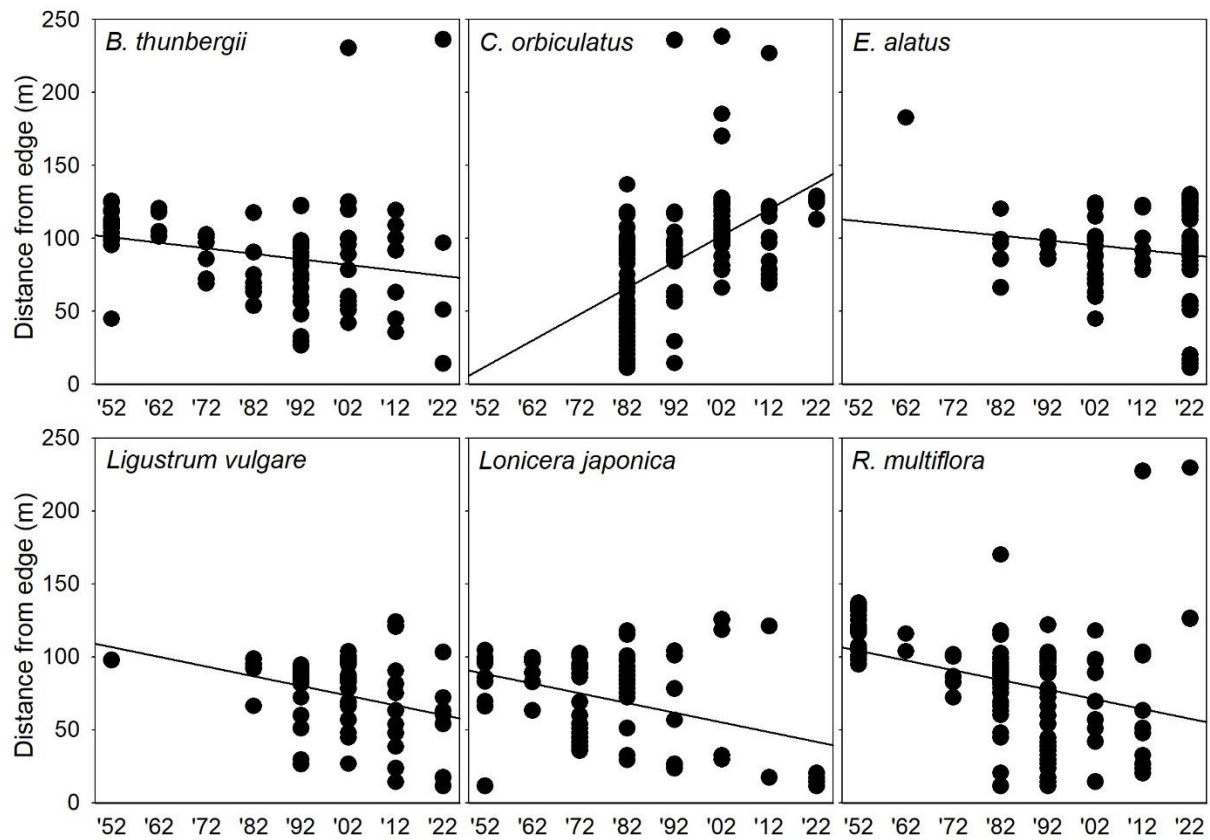


Figure S3. Distance of newly colonized plots from the edge of the natural area over time. Circles indicate individual newly colonized plots and the line is the simple linear regression of distance by time from the beginning of the study (see Table 1 in the paper)

S4. Comparisons of species richness between colonized and uncolonized plots

Table S4. Result of t-tests comparing total, introduced (including both invasive and non-invasive species), and native species richness between colonized (Col.) and uncolonized (Un.) plots in each year. P-adj is the P value after Holm-Bonferroni adjustment for multiple tests. Rows in bold indicate P-adj<0.05.

Species	Year	Total Species Richness					Introduced Species Richness					Native Species Richness				
		Col.	Un.	T	P	P-adj. ^a	Col.	Un.	T	P	P-adj. ^a	Col.	Un.	T	P	P-adj. ^a
<i>Berberis thunbergii</i>	1992	11.6 (0.6)	10.3 (0.4)	-1.64	0.10	0.31	2.7 (0.2)	1.1 (0.15)	-4.89	<0.001	<0.001	8.9 (0.5)	9.2 (0.3)	0.51	0.613	1.23
	2002	12.7 (0.8)	6.9 (0.2)	-6.75	<0.001	<0.001	2.4 (0.4)	0.4 (0.05)	-5.29	<0.001	0.001	10.3 (0.8)	6.6 (0.2)	-3.77	<0.001	0.003
<i>Celastrus orbiculatus</i>	1982	9.3 (0.6)	5.8 (0.1)	-5.63	<0.001	<0.001	1.9 (0.2)	0.1 (0.02)	-9.07	<0.001	<0.001	7.4 (0.5)	5.7 (0.1)	-3.12	0.003	0.030
	1992	11.6 (0.8)	6.6 (0.2)	-5.25	<0.001	<0.001	1.8 (0.3)	0.1 (0.03)	-4.93	<0.001	<0.001	9.8 (0.8)	6.4 (0.2)	-3.72	<0.001	0.003
	2002	11.3 (0.7)	6.7 (0.2)	-6.26	<0.001	<0.001	1 (0.3)	0.1 (0.02)	-2.88	0.007	0.029	10.3 (0.5)	6.6 (0.2)	-5.33	<0.001	<0.001
	2012	10.7 (1.2)	7.0 (0.2)	-3.47	<0.001	0.005	1.3 (0.5)	0.1 (0.02)	-2.58	0.026	0.051	9.4 (0.9)	7.0 (0.2)	-2.39	0.017	0.16
<i>Euonymus alatus</i>	2002	13.0 (1.0)	9.9 (0.4)	-2.63	0.009	0.046	2.8 (0.4)	1.2 (0.13)	-3.88	<0.001	<0.001	10.2 (0.8)	8.7 (0.3)	-1.48	0.140	0.56
	2022	10.1 (0.5)	6.4 (0.1)	-6.98	<0.001	<0.001	1.5 (0.3)	0.3 (0.04)	-4.26	<0.001	0.001	8.6 (0.4)	6.2 (0.1)	-4.93	<0.001	<0.001
<i>Ligustrum vulgare</i>	1992	10.7 (0.7)	11.1 (0.5)	0.52	0.60	1.207	2.7 (0.2)	2.3 (0.19)	-1.19	0.240	0.24	8.0 (0.6)	8.8 (0.4)	1.05	0.298	0.90
	2002	13.6 (0.8)	8.4 (0.3)	-5.69	<0.001	<0.001	3.1 (0.3)	0.6 (0.08)	-9.49	<0.001	<0.001	10.6 (0.7)	7.9 (0.3)	-3.26	0.001	0.015
	2012	11.7 (1.1)	7.6 (0.2)	-3.46	<0.001	0.004	2.1 (0.4)	0.3 (0.04)	-4.71	<0.001	0.003	9.6 (1)	7.3 (0.2)	-2.09	0.038	0.26
<i>Lonicera japonica</i>	1972	13.0 (0.8)	10 (0.5)	-2.93	0.004	0.026	4.5 (0.4)	1.5 (0.27)	-5.99	<0.001	<0.001	8.5 (0.7)	8.5 (0.5)	0.05	0.959	0.96
	1982	8.8 (0.6)	6.0 (0.1)	-4.21	<0.001	<0.001	1.6 (0.3)	0.1 (0.02)	-5.93	<0.001	<0.001	7.3 (0.6)	5.9 (0.1)	-2.08	0.038	0.23
<i>Rosa multiflora</i>	1982	10.1 (0.7)	6.8 (0.2)	-4.69	<0.001	<0.001	1.8 (0.2)	0.3 (0.05)	-7.01	<0.001	<0.001	8.3 (0.6)	6.5 (0.2)	-2.73	0.007	0.07
	1992	9.4 (0.5)	9.1 (0.3)	-0.35	0.72	0.724	1.7 (0.2)	0.3 (0.06)	-8.27	<0.001	<0.001	7.7 (0.5)	8.9 (0.3)	2.00	0.047	0.24
	2012	10.9 (1.7)	7.2 (0.2)	-2.14	0.06	0.240	1.4 (0.4)	0.1 (0.02)	-3.04	0.014	0.042	9.5 (1.5)	7.1 (0.2)	-2.17	0.030	0.24