Supplementary Material

Local factors influence the wild bee functional community at the urban-forest interface

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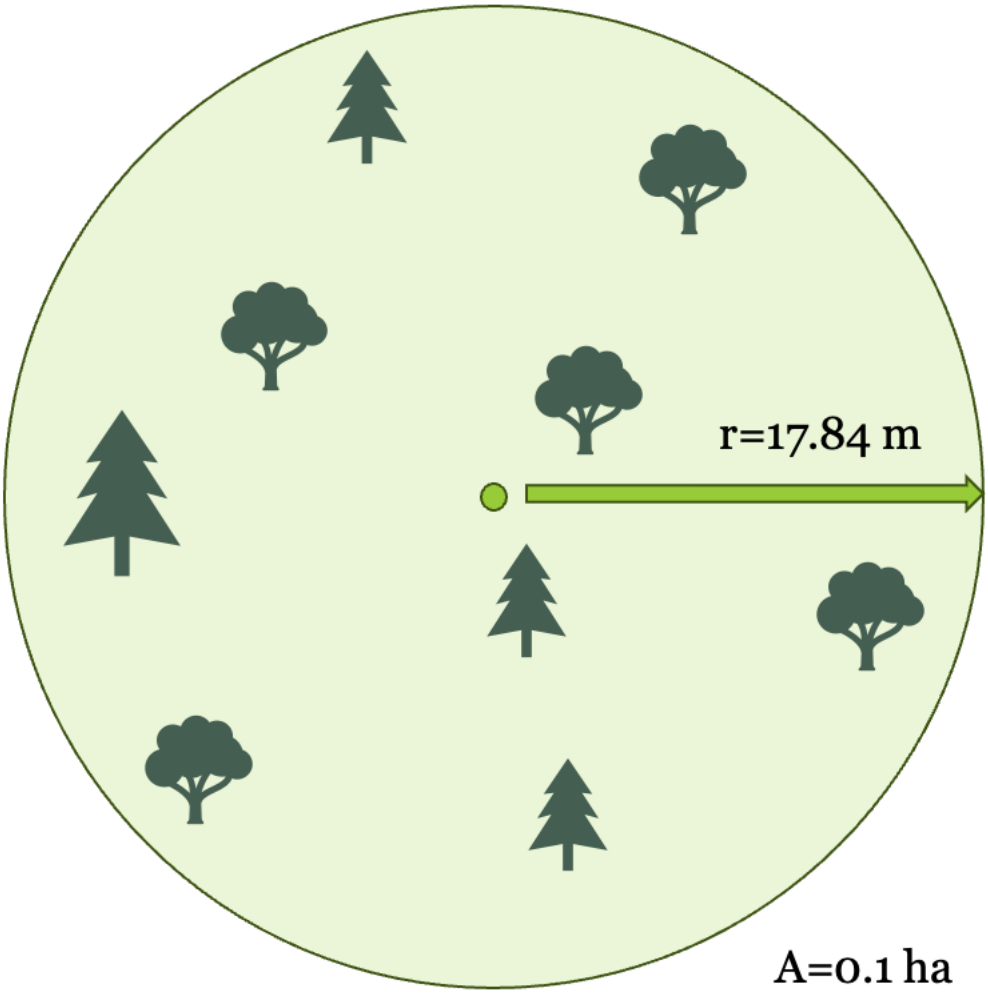
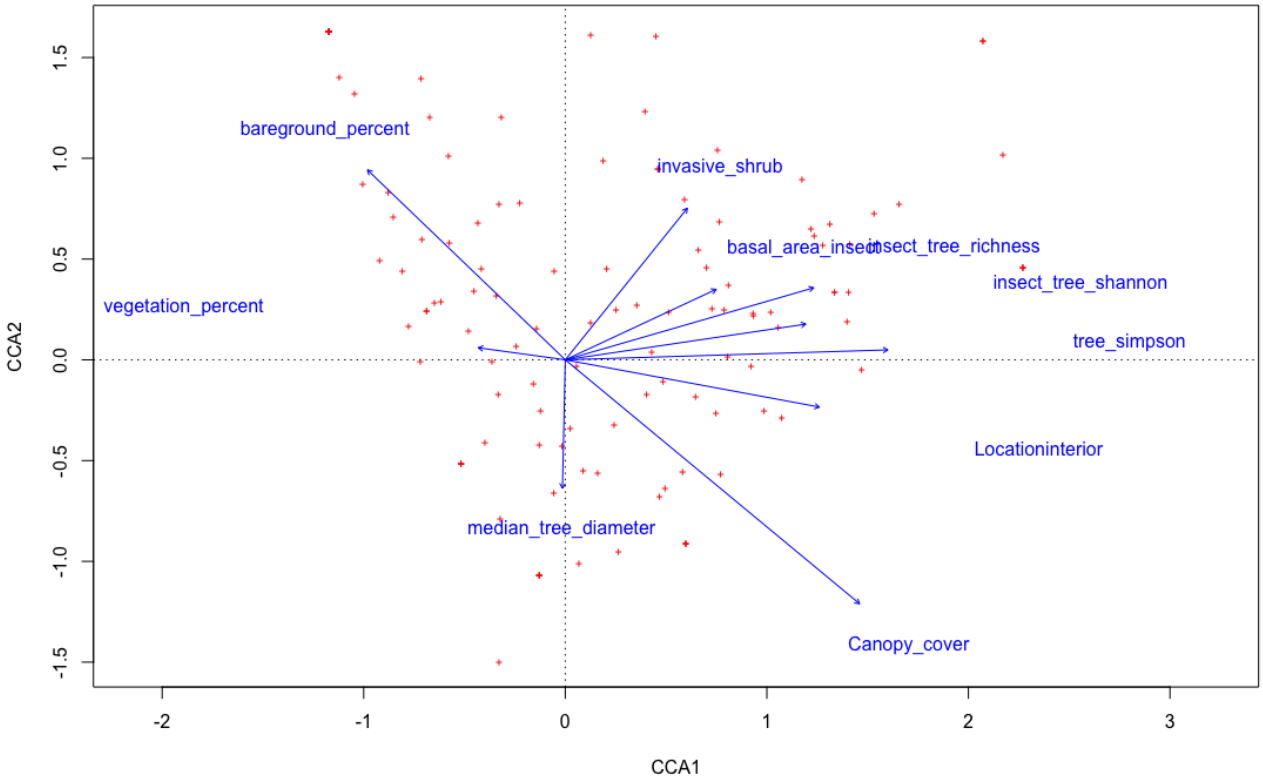
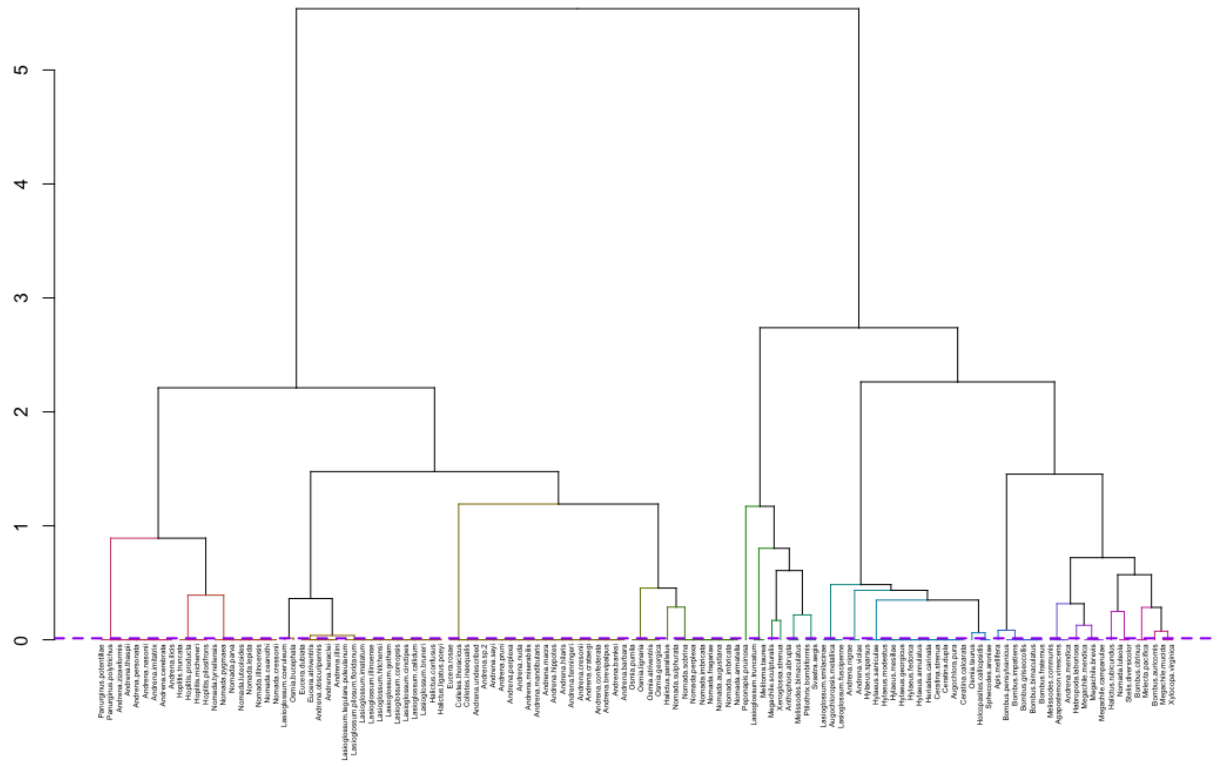
1.1 Supplementary Figures



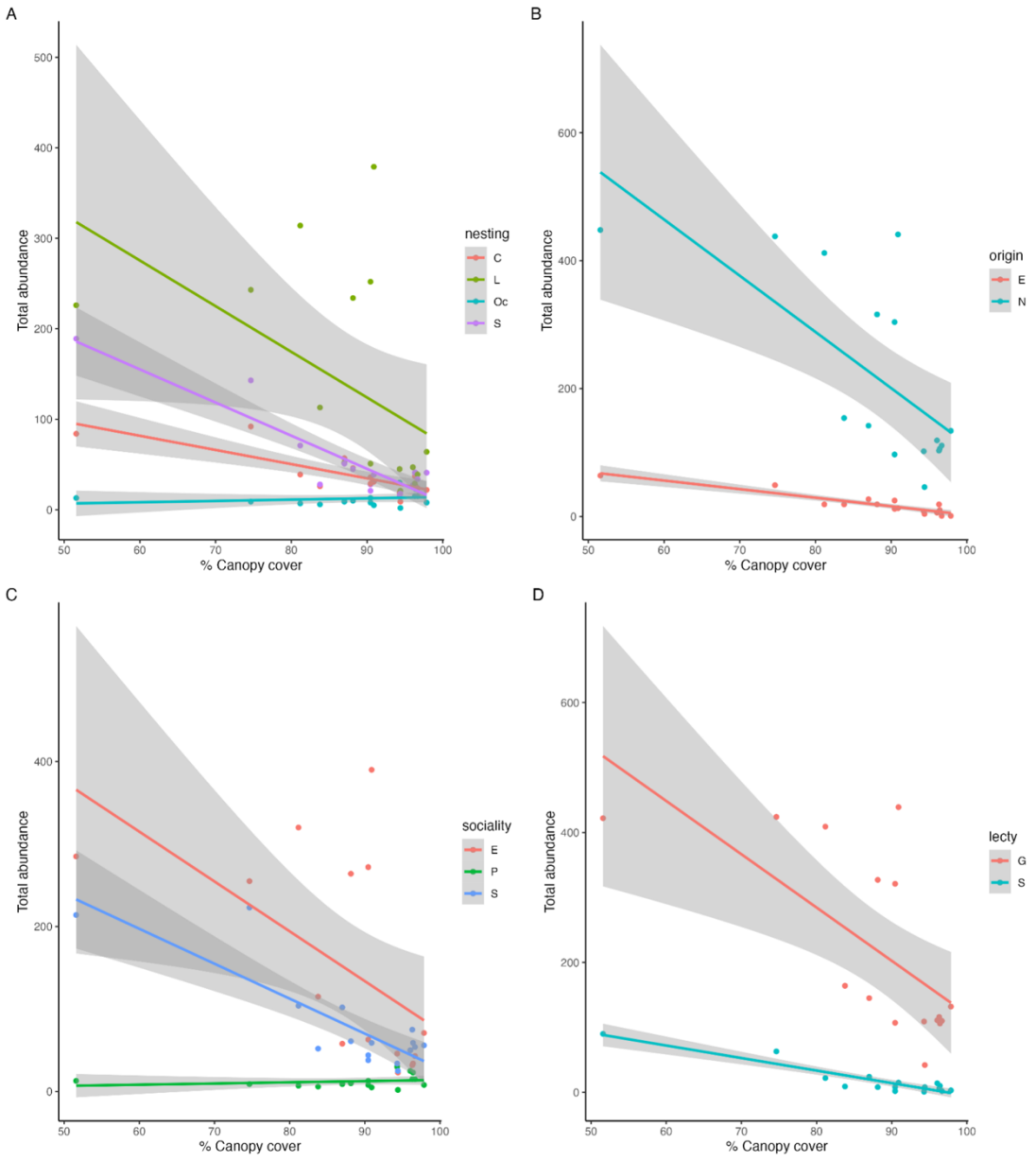
Supplemental Figure 1. Schematic showing tree community assessment. Each tree within a 0.1-hectare plot (radius= 17.84 m) was identified and measured.



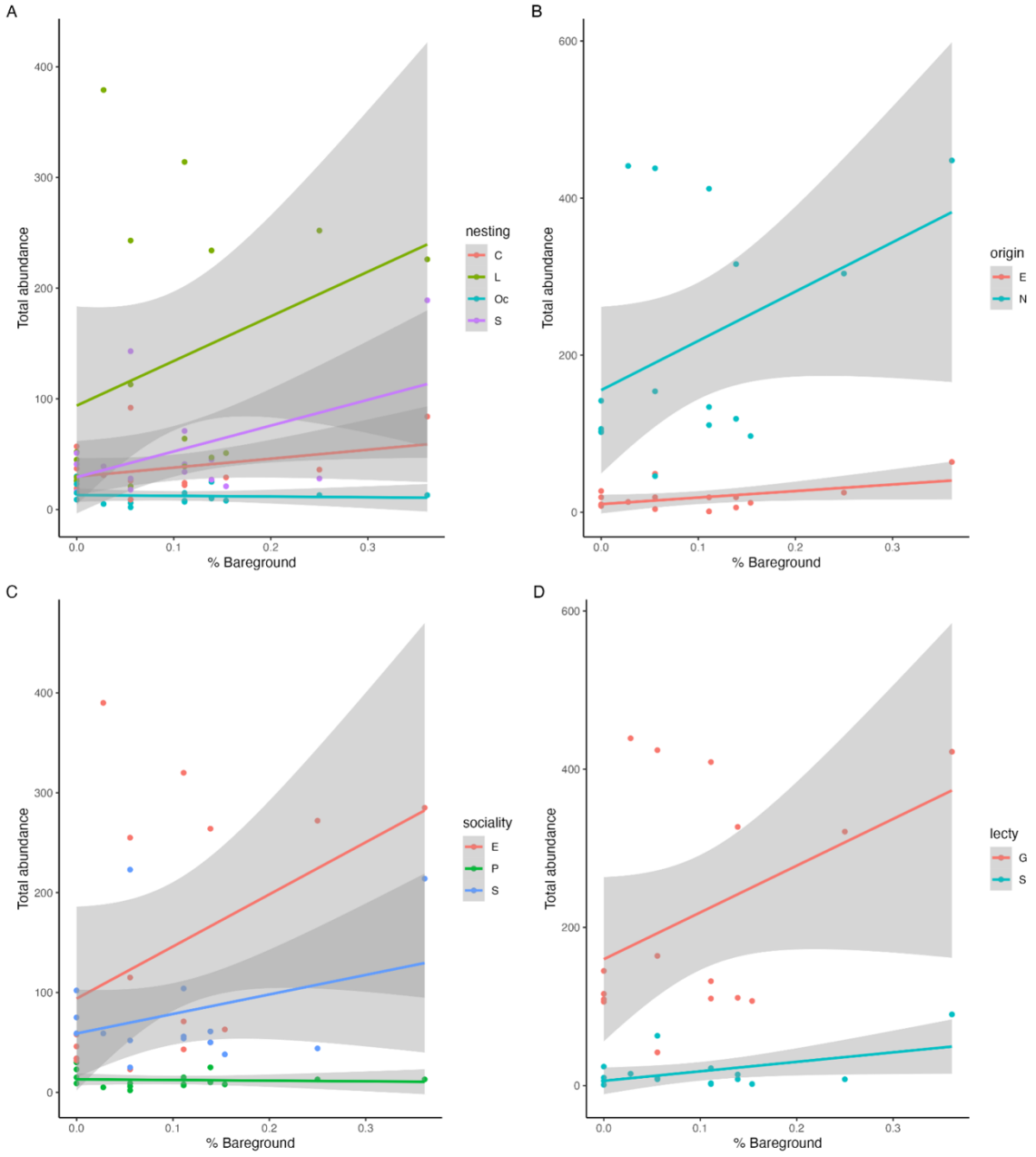
Supplemental Figure 2. The Canonical Correspondence Analysis (CCA) of environmental parameters x species composition. Environmental parameters explain 32.7% of the variation in species composition (adj R^2= 0.326586).



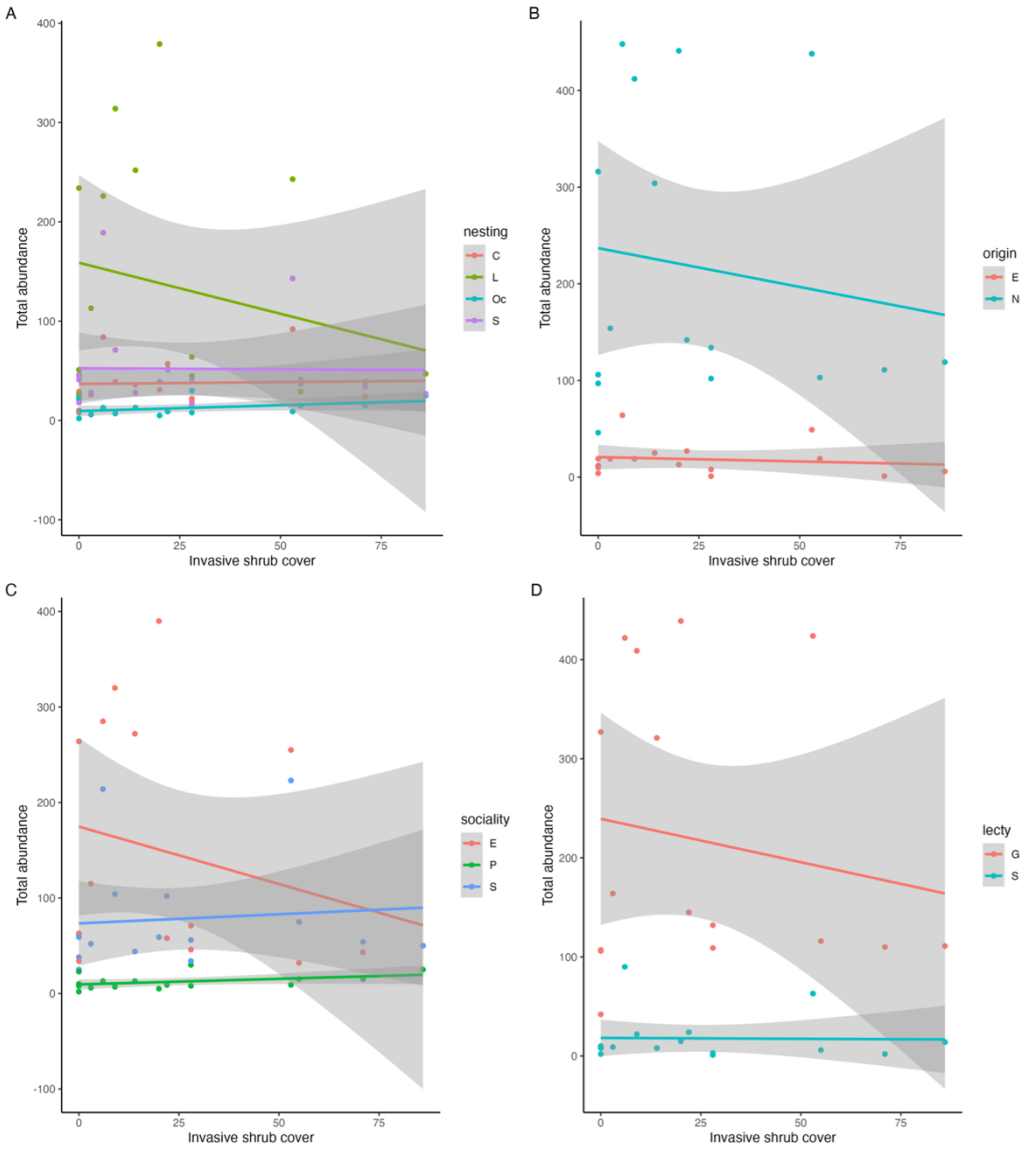
Supplemental Figure 3. Dendrogram reveals species make up of 32 clusters identified in the cluster analysis.



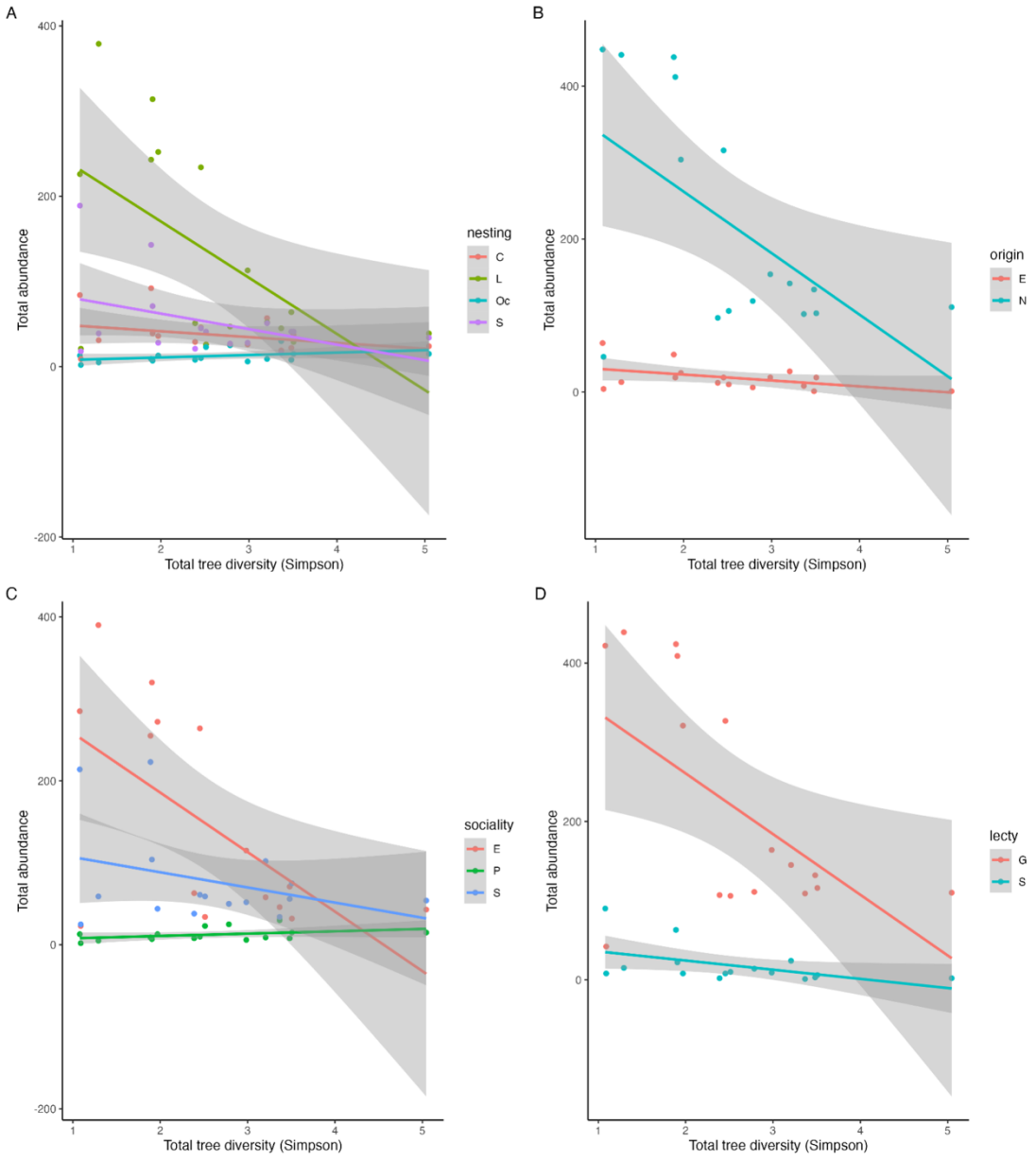
Supplemental Figure 4. Linear models exploring percent canopy cover on bee abundance of nesting (a), origin (b), sociality (c), and diet breath (d) functional groups.



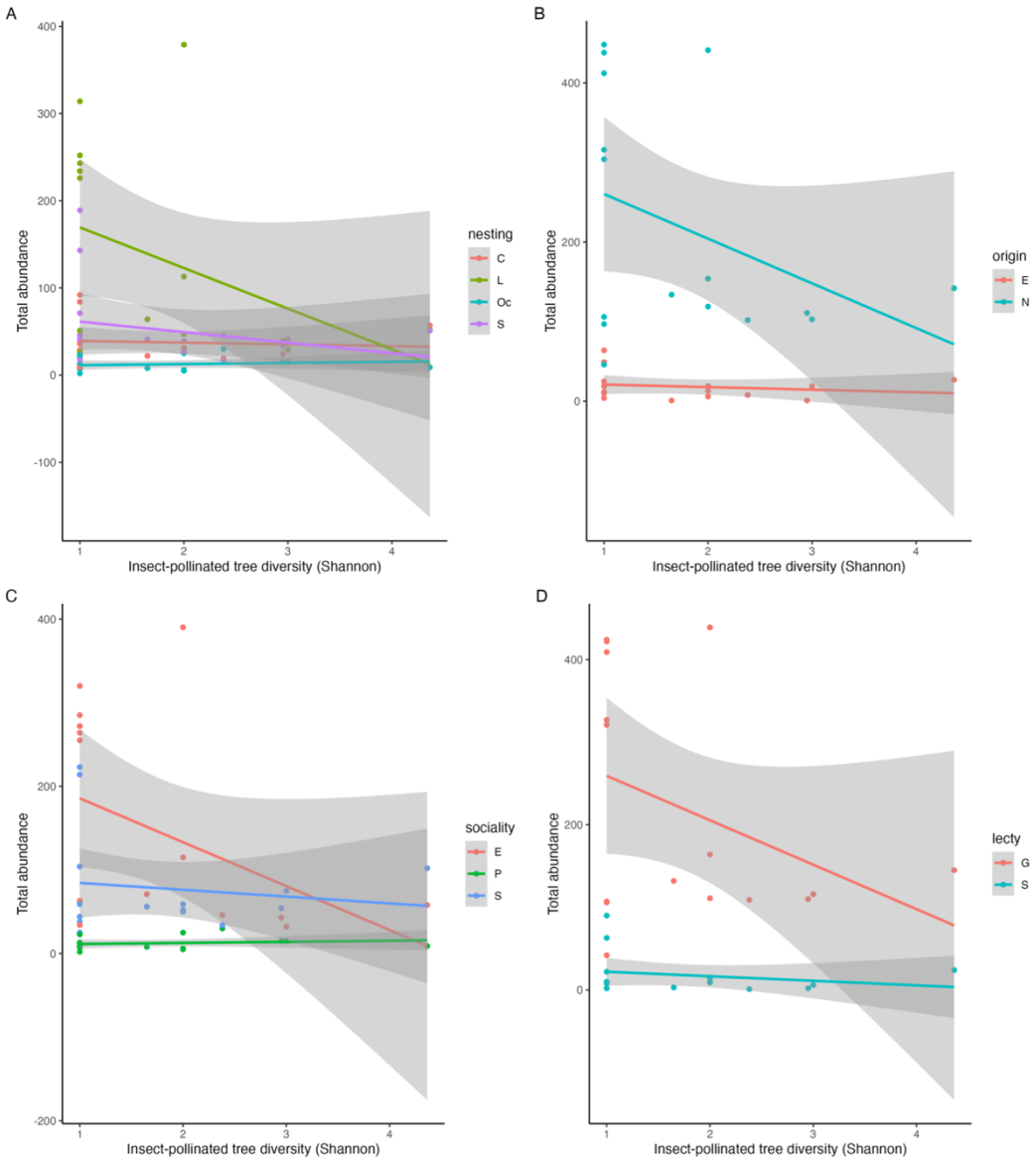
Supplemental Figure 5. Linear models exploring percent bare ground on bee abundance of nesting (a), origin (b), sociality (c), and diet breath (d) functional groups.



Supplemental Figure 6. Linear models exploring invasive shrub cover on bee abundance of nesting (a), origin (b), sociality (c), and diet breath (d) functional groups.



Supplemental Figure 7. Linear models exploring Simpson tree diversity on bee abundance of nesting (a), origin (b), sociality (c), and diet breath (d) functional groups.



Supplemental Figure 8. Linear models exploring Shannon diversity of insect-pollinated tree on bee abundance of nesting (a), origin (b), sociality (c), and diet breath (d) functional groups.

1.2 Supplementary Tables

Supplemental table 1. Site location coordinates.

Site	Edge GPS	Interior GPS
Southeast Clarke Park	33.927413, -83.306916	33.926376, -83.306871
State Botanical Gardens of Georgia	33.982166, -83.379980	33.982166, -83.379980
Oconee Forest Park	33.928931, -83.370004	33.928653, -83.371376
Sandy Creek Nature Center	33.982166, -83.379980	33.982166, -83.379980
Virginia Walker Calloway Park	33.965104,-83.358774	33.966271, -83.360001
Woodland Gardens Organic Farm	33.9615390, -83.3081860	33.9626180, -83.306850
Ben Burton Park	33.959161, -83.438344	33.959466, -83.437329
residential site	33.964834,-83.291395	33.965259,-83.291086

Supplemental table 2. List of species sampled within this study with functional designations for origin (E=exotic; N=native), lecty (G=generalist; S=specialist), nesting (S=soil; L=litter; C=cavity; Oc=occupied), sociality (S=solitary; E=eusocial), sixe (S=small;M=medium; L=large), and seasonality (E=early, M=mid, and L=late). Location may be edge if found only at forest edge, interior if found only at interior, and both if found at both locations.

Species	Authority	Origin	Lecty	Nesting	Sociality	Size	Seasonality	Location
Agapostemon virescens	(Fabricius, 1775)	N	G	S	S	M	M	edge
Andrena banksi	Malloch, 1917	N	G	S	S	M	E	edge
Andrena barbara	Bouseman & LaBerge, 1979	N	G	S	S	M	E	both
Andrena brevipalpus	Cockerell, 1930	N	G	S	S	M	E	edge
Andrena cerebrata	Mitchell, 1960	N	G	S	S	S	E	both
Andrena confederata	Vierek, 1918	N	G	S	S	M	E	both
Andrena crataegi	Robertson, 1893	N	G	S	S	M	E	both
Andrena cresonii	Robertson, 1891	N	G	S	S	S	E	edge
Andrena fenningeri	Vierek, 1922	N	G	S	S	M	E	edge
Andrena heraclei	Robertson, 1897	N	G	S	S	L	E	interior
Andrena hilaris	Smith, 1853	N	G	S	S	M	E	both

Andrena hippotes	Robertson, 1895	N	G	S	S	M	E	both
Andrena ilicis	Mitchell, 1960	N	G	S	S	S	E	both
Andrena illini	Bouseman & LaBerge, 1979	N	G	S	S	L	E	both
Andrena imitatrix	Cresson, 1872	N	G	S	S	S	E	both
Andrena macra	Mitchell, 1951	N	G	S	S	M	E	both
Andrena mandibularis	Robertson, 1892	N	G	S	S	M	E	edge
Andrena mendica	Mitchell, 1960	N	G	S	S	M	M	interior
Andrena miserabilis	Cresson, 1872	N	G	S	S	M	E	edge
Andrena nasonii	Robertson, 1895	N	G	S	S	S	E	both
Andrena nigrae	Robertson, 1905	N	S	S	S	S	E	edge
Andrena nuda	Robertson, 1891	N	G	S	S	M	E	both
Andrena obscuripennis	Smith, 1853	N	G	S	S	L	E	both
Andrena perplexa	Smith, 1853	N	G	S	S	M	E	both

Andrena personata	Robertson, 1897	N	G	S	S	S	E	both
Andrena pruni	Robertson, 1891	N	G	S	S	M	E	both
Andrena sayi	Robertson, 1891	N	G	S	S	M	E	both
Andrena sp.2	undescribed	N	G	S	S	M	E	edge
Andrena thaspii	Graenicher, 1903	N	G	S	S	S	E	edge
Andrena undescribed	undescribed, known	N	G	S	S	M	E	both
Andrena violae	Robertson, 1891	N	S	S	S	S	E	both
Andrena zizaeformis	Cockerell, 1908	N	G	S	S	S	E	edge
Anthophora abrupta	Say, 1838	N	G	S	S	L	M	edge
Apis mellifera	Linnaeus, 1758	E	G	C	E	L	M	both
Augochlora pura	(Say, 1837)	N	G	C	S	S	M	both
Augochloropsis metallica	(Fabricius, 1793	N	G	S	S	S	M	edge
Bombus auricomis	(Robertson, 1903)	N	G	L	S	L	M	edge
Bombus bimaculatus	Cresson, 1863	N	G	L	E	L	M	both

Bombus citrinus	(Smith, 1854)	N	G	Oc	P	L	M	edge
Bombus fraternus	(Smith, 1854)	N	G	L	E	L	M	edge
Bombus griseocollis	(DeGreer, 1773)	N	G	L	E	L	M	both
Bombus impatiens	Cresson, 1863	N	G	L	E	L	M	both
Bombus pensylvanicus	(DeGreer, 1773)	N	G	L	E	L	M	both
Ceratina calcarata	Robertson, 1900	N	G	C	S	S	M	both
Ceratina dupla	Say, 1837	N	G	C	S	S	M	both
Ceratina strenua	Smith, 1879	N	G	C	S	S	M	both
Colletes inaequalis	Say, 1837	N	G	S	S	M	E	interior
Colletes thoracicus	Smith, 1853	N	G	S	S	M	E	both
Eucera atriventris	(Smith, 1854)	N	G	S	S	L	E	both
Eucera dubiata	(Cresson, 1878)	N	G	S	S	L	E	both
Eucera rosae	(Robertson, 1900)	N	G	S	S	M	E	both
Habropoda laboriosa	(Fabricius, 1804)	N	S	S	S	L	E	both

Halictus confusus	Smith, 1853	N	G	S	E	S	M	interior
Halictus ligatus/poeyi	Say, 1837	N	G	S	E	S	M	both
Halictus parallelus	Say, 1837	N	G	S	E	M	E	edge
Halictus rubicundus	(Christ, 1791)	N	G	S	E	M	M	both
Heriades carinata	Cresson, 1864	N	G	C	S	S	M	edge
Holcopasites calliopsidis	(Linsley, 1943)	N	G	Oc	P	S	M	edge
Hoplitis micheneri	Mitchell, 1962	N	G	C	S	S	E	edge
Hoplitis pilosifrons	(Cresson, 1864)	N	G	C	S	S	E	edge
Hoplitis producta	(Cresson, 1864)	N	G	C	S	S	E	edge
Hoplitis truncata	(Cresson, 1878)	N	G	C	S	S	E	edge
Hylaeus annulatus	(Linnaeus, 1758)	N	G	C	S	S	M	interior
Hylaeus fedorica	(Cockerell, 1909)	N	G	C	S	S	M	both
Hylaeus georgicus	(Cockerell, 1896)	N	G	C	S	S	M	edge
Hylaeus mesillae	(Cockerell, 1896)	N	G	C	S	S	M	both
Hylaeus modestus	Say, 1837	N	G	C	S	S	M	both

Hylaeus saniculae	(Robertson, 1896)	N	G	C	S	S	M	both
Hylaeus sparsus	(Cresson, 1869)	N	G	C	S	S	M	both
Lasioglossum bruneri	(Crawford, 1892)	N	G	S	E	S	M	both
Lasioglossum callidum	(Sandhouse, 1924)	N	G	S	E	S	M	both
Lasioglossum cinctipes	(Provancher, 1888)	N	G	S	E	S	M	edge
Lasioglossum coeruleum	(Robertson, 1893)	N	G	C	E	S	M	both
Lasioglossum coreopsis	(Robertson, 1902)	N	G	S	E	S	M	edge
Lasioglossum fuscipenne	(Smith, 1853)	N	G	S	S	S	M	both
Lasioglossum gotham	Gibbs, 2011	N	G	S	E	S	M	interior
Lasioglossum hitchensi	Gibbs, 2012	N	G	S	E	S	M	both
Lasioglossum illinoense	(Robertson, 1892)	N	G	S	E	S	M	edge
Lasioglossum imatatum	(Smith, 1853)	N	G	S	E	S	M	both
Lasioglossum pilosum/floridanum	(Robertson, 1892)	N	G	S	E	S	M	interior
Lasioglossum smilacinae	(Robertson, 1897)	N	G	S	S	S	M	both

Lasioglossum tegulare/puteulanum	(Robertson, 1890) Gibbs, 2009	N	G	S	E	S	M	edge
Lasioglossum truncatum	(Robertson, 1901)	N	S	S	S	S	E	both
Megachile brevis	Say, 1837	N	G	C	S	M	M	edge
Megachile campanulae	(Robertson, 1903)	N	G	C	S	M	M	edge
Megachile mendica	Cresson, 1878	N	G	C	S	M	M	both
Megachile mucida	Cresson, 1878	N	G	C	S	L	M	edge
Megachile sculpturalis	Smith, 1853	E	G	C	S	L	M	both
Melecta pacifica	Cresson, 1878	N	G	Oc	P	L	E	edge
Melissodes bimaculatus	(Lepeltier, 1825)	N	G	S	S	L	M	both
Melissodes communis	Cresson, 1878	N	G	S	S	M	M	edge
Melitoma taurea	(Say, 1837)	N	S	S	S	L	M	both
Nomada imbricata	Smith, 1854	N	G	Oc	P	M	E	both
Nomada armatella	Cockerell, 1903	N	G	Oc	P	M	E	both
Nomada augustiana	Mitchell, 1962	N	G	Oc	P	M	E	edge

Nomada ceanothi	Cockerell, 1907	N	G	Oc	P	S	E	both
Nomada cressonii	Robertson, 1893	N	G	Oc	P	S	E	both
Nomada fragariae	Mitchell, 1962	N	G	Oc	P	M	E	both
Nomada illinoensis	Robertson, 1900	N	G	Oc	P	S	E	interior
Nomada imbricata	Smith, 1854	N	G	Oc	P	M	E	both
Nomada lepida	Cresson, 1863	N	G	Oc	P	S	E	interior
Nomada luteola	Olivier, 1812	N	G	Oc	P	M	M	both
Nomada luteoloides	Robertson, 1895	N	G	Oc	P	S	E	both
Nomada parva	Robertson, 1900	N	G	Oc	P	S	E	edge
Nomada perplexa	Cresson, 1863	N	G	Oc	P	M	E	interior
Nomada pygmaea	Cresson, 1863	N	G	Oc	P	S	E	interior
Nomada sobrina	Mitchell, 1962	N	G	Oc	P	M	E	both
Nomada sulphurata	Smith, 1854	N	G	Oc	P	M	E	both
Nomada tyrrellensis	Mitchell	N	G	Oc	P	S	E	both

Osmia atriventris	Cresson, 1864	N	G	C	S	M	E	both
Osmia bucephala	Cresson, 1864	N	G	C	S	L	E	interior
Osmia georgica	Cresson, 1878	N	S	C	S	M	E	both
Osmia lignaria	Say, 1837	N	G	C	S	M	E	both
Osmia pumila	Cresson, 1864	N	G	C	S	M	E	both
Osmia taurus	Smith, 1873	E	G	C	S	M	E	both
Panurginus polytrichus	Cockerell, 1909	N	G	S	S	S	E	edge
Panurginus potentillae	(Crawford, 1916)	N	G	S	S	S	E	edge
Peponapis pruinosa	(Say, 1837)	E	S	S	S	L	M	edge
Ptilothrix bombiformis	(Cresson, 1878)	N	S	S	S	L	L	both
Sphecodes aroniae	(Mitchell, 1960)	N	G	Oc	P	S	M	edge
Stelis diversicolor	Crawford, 1916	N	G	Oc	P	M	M	both
Svastra aegis	(LaBerge, 1956)	N	S	S	S	L	L	edge
Xenoglossa strenua	(Cresson, 1878)	N	S	S	S	L	M	edge

Xylocopa virginica	(Linnaeus, 1771)	N	G	C	S	L	M	both

Supplemental table 3: Results from envfit() multiple regression assessing environmental parameters with NMDS axes.

	NMDS1	*NMDS2*	*r2*	*Pr(>r)*
Location	0.93727	-0.34861	0.4153	0.4153
Tree Simpson diversity	0.99102	-0.13368	0.5370	0.006 **
Median tree diameter	-0.36149	0.93238	0.0354	0.791
Insect-pollinated tree richness	0.66643	-0.74557	0.4058	0.033 *
Insect-pollinated tree Shannon diversity	0.73537	-0.67767	0.3668	0.054 .
Basal area of insect-pollinated trees	0.49449	-0.86918	0.1538	0.408
Canopy cover	0.99908	-0.04298	0.4813	0.009 **
Invasive shrub density	0.84363	-0.53692	0.2984	0.097 .
Bare ground cover	-0.42332	0.90598	0.5408	0.007 **