

**Supplementary information**

***Biodiversity-forest structural diversity relationships differ among taxa***

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**Supplementary Table 1 | National Ecological Observatory Network (NEON) study site characteristics and sampling years.** MAT–mean annual temperature, MAP–mean annual precipitation, FSD–forest structural diversity.

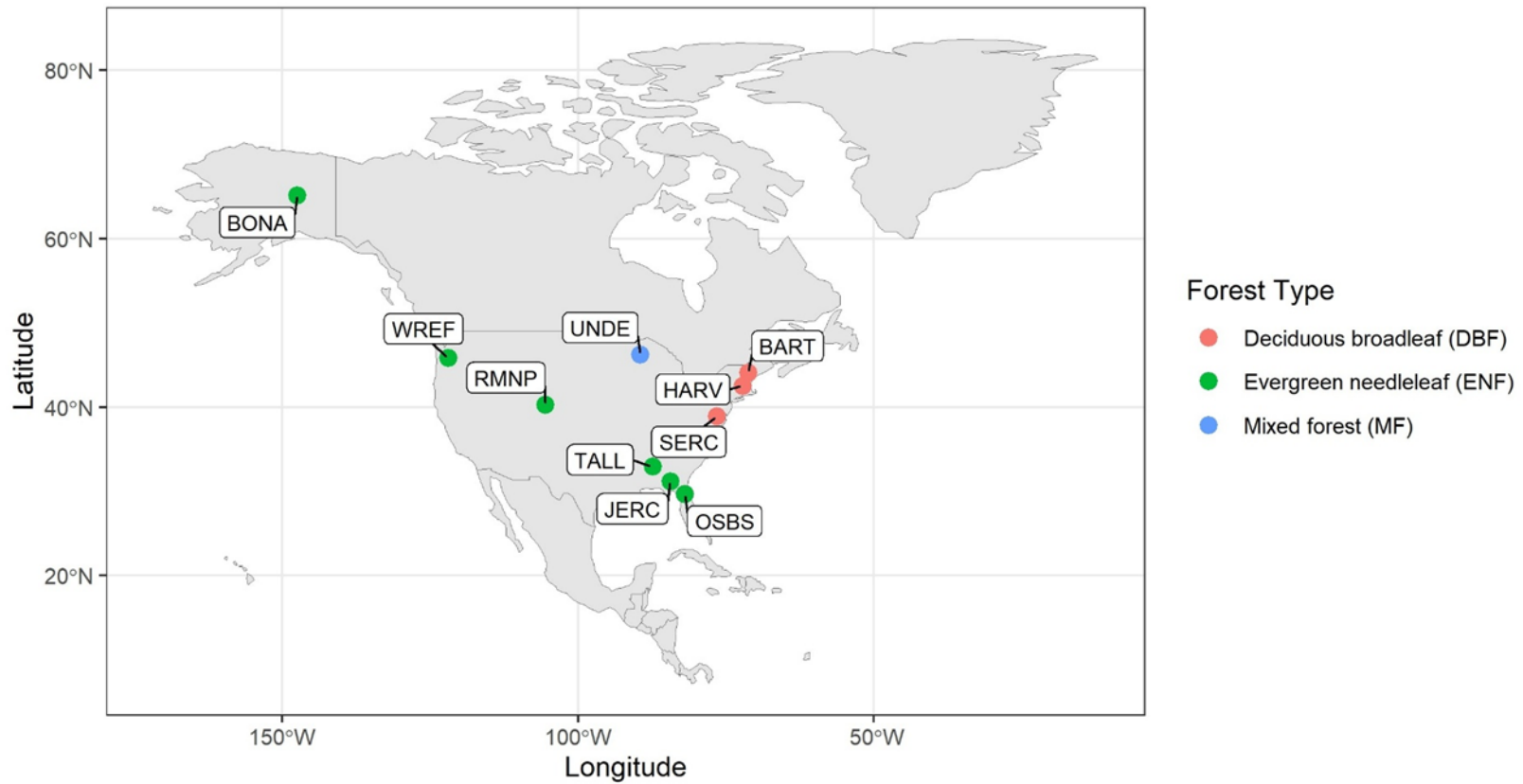
Site ID	Site Name	Latitude	Longitude	MAT (C)	MAP (mm)	Forest Type	Mammals	Birds	Beetles	Plants	FSD
BART	Bartlett Experimental Forest NEON	44.06389	-71.2874	6.2	1325	DBF	2019	2019	NA	2019	2019
BONA	Caribou-Poker Creeks Research Watershed NEON	65.15401	-147.503	-3	262	ENF	2021	2021	NA	NA	2021
DEJU	Delta Junction NEON	63.88112	-145.751	-3	305	ENF	NA	2021	NA	NA	2021
DELA	Dead Lake NEON	32.54173	-87.8039	17.6	1372	MF	NA	NA	2021	2021	2021
GRSM	Great Smoky Mountains National Park NEON	35.68896	-83.502	13.1	1375	DBF	NA	NA	2018	2018	2018
GUAN	Guanica Forest NEON	17.96955	-66.8687	23	840	EBF	NA	2018	NA	2018	2018
HARV	Harvard Forest & Quabbin Watershed NEON	42.53691	-72.1727	7.4	1199	DBF	2019	2019	2019	2019	2019
JERC	The Jones Center At Ichauway NEON	31.19484	-84.4686	19.2	1308	ENF	2021	2021	2020	NA	2021
LENO	Lenoir Landing NEON	31.85386	-88.1612	18.1	1386	DBF	NA	NA	2021	NA	2021
MLBS	Mountain Lake Biological Station NEON	37.37831	-80.5248	8.8	1227	DBF	NA	2021	2021	NA	2021
OSBS	Ordway-Swisher	29.68928	-81.9934	20.9	1302	ENF	2021	2021	2020	2021	2021

	Biological Station NEON										
PUUM	Pu'u Maka'ala Natural Area Reserve NEON	19.55309	-155.317	12.7	2657	EBF	NA	NA	2019	2019	2019
RMNP	Rocky Mountains NEON	40.2759	-105.546	2.9	731	ENF	2020	NA	2020	2020	2020
SCBI	Smithsonian Conservation Biology Institute NEON	38.89293	-78.1395	11.6	1126	DBF	NA	NA	NA	2021	2021
SERC	Smithsonian Environmental Research Center NEON	38.89013	-76.56	13.6	1075	DBF	2021	NA	2021	2021	2021
SOAP	Soaproot Saddle NEON	37.03337	-119.262	13.4	900	ENF	NA	NA	2019	NA	2021
STEI	Steigerwaldt-Chequamegon NEON	45.50894	-89.5864	4.8	797	DBF	NA	2020	NA	NA	2020
TALL	Talladega National Forest NEON	32.95047	-87.3933	17.2	1383	ENF	2021	2021	2021	2020	2021
TEAK	Lower Teakettle NEON	37.00583	-119.006	8	1223	ENF	NA	2021	NA	NA	2021
UKFS	University of Kansas Field Station NEON	39.04043	-95.1922	12.7	990	DBF	NA	NA	2020	NA	2020
UNDE	University of Notre Dame Environmental Research Center NEON	46.23391	-89.5373	4.3	802	MF	2020	2020	2020	NA	2020
WREF	Wind River Experimental Forest NEON	45.82049	-121.952	9.2	2225	ENF	2021	2021	2021	2021	2021

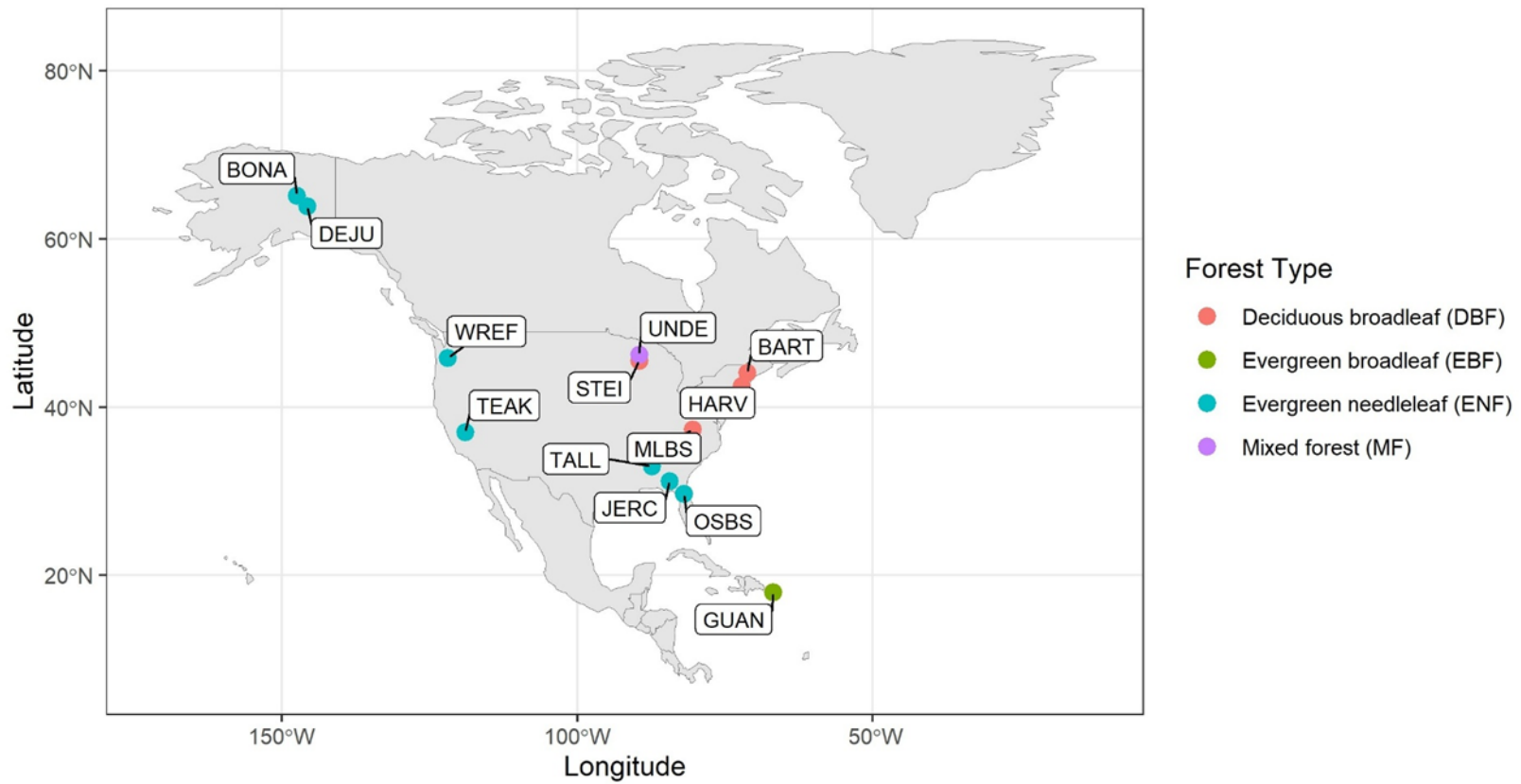
**Supplementary Table 2 | Summary of sample sizes and area sampled for each taxon.** Values in parentheses indicate the maximum number of units available before subsampling — for column 3, these values reflect the site with the most plots, which we used to determine sample size in order to ensure that  $\geq$  half of the plots at each site were included in estimates of taxonomic diversity.

Taxon	No. Sites	No. Plots Site <sup>-1</sup>	Area Sampled Plot <sup>-1</sup>	Total Area Sampled Site <sup>-1</sup>
Understory plants	12 (25)	17 (33)	6–8 1 m <sup>2</sup> subplots	102–136 m <sup>2</sup>
Trees	12/15*	17/6*	400 m <sup>2</sup>	6,800/2,400 m <sup>2</sup>
Beetles	15 (20)	6 (11)	1600 m <sup>2</sup>	9,600 m <sup>2</sup>
Birds	13 (13)	6 (10)	250,000 m <sup>2</sup>	1.5 km <sup>2</sup>
Mammals	10 (11)	5 (8)	8100 m <sup>2</sup>	40,500 m <sup>2</sup>

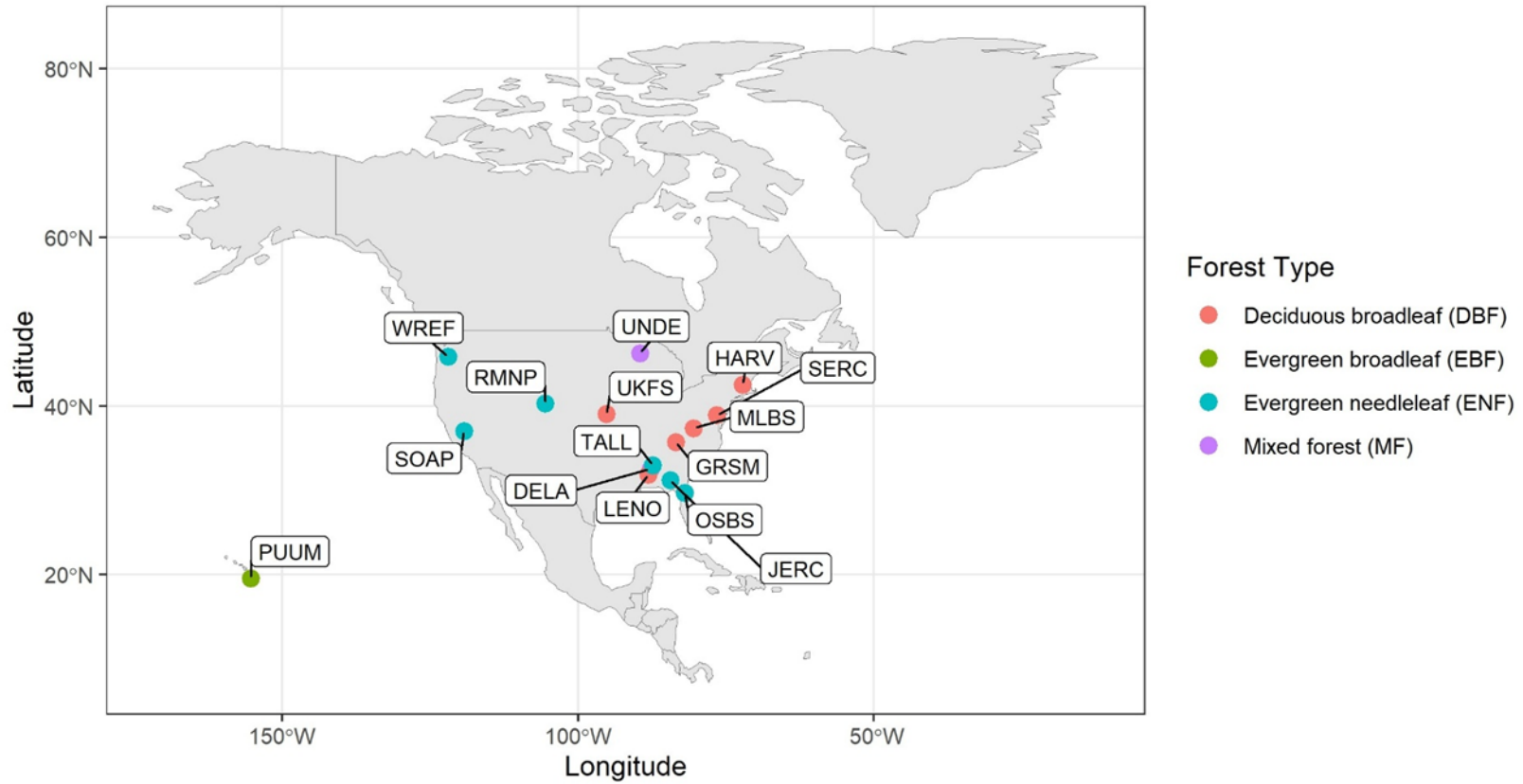
\*Number of sites and plots sampled for trees reflects the number sampled for understory plants and beetles, respectively.



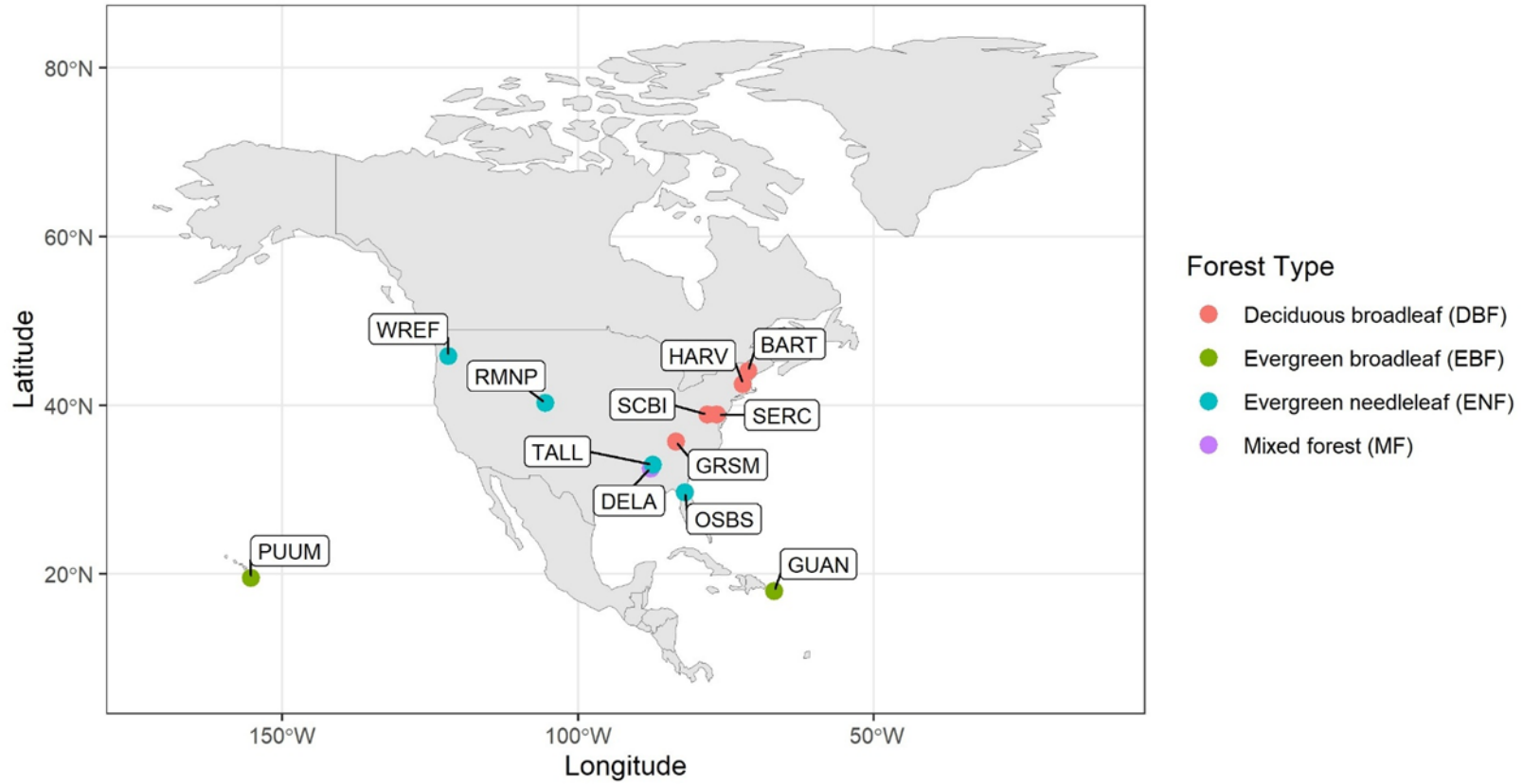
**Supplementary Fig. 1 | Map of National Ecological Observatory Network (NEON) study sites used to assess relationships between small mammal diversity and forest structural diversity. See Supplementary Table 1 for site descriptions.**



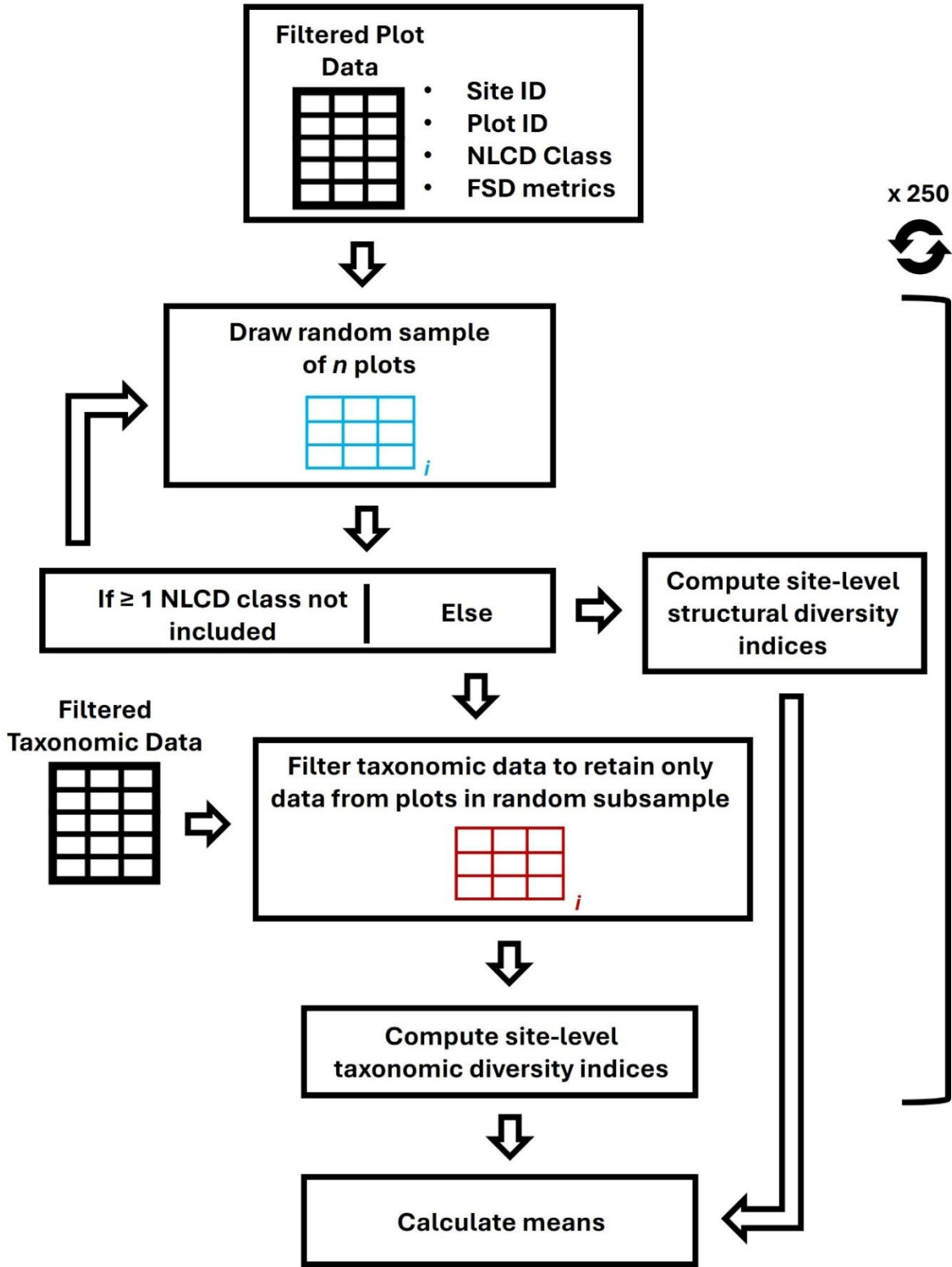
**Supplementary Fig. 2 | Map of National Ecological Observatory Network (NEON) study sites used to assess relationships between bird diversity and forest structural diversity. See Supplementary Table 1 for site descriptions.**



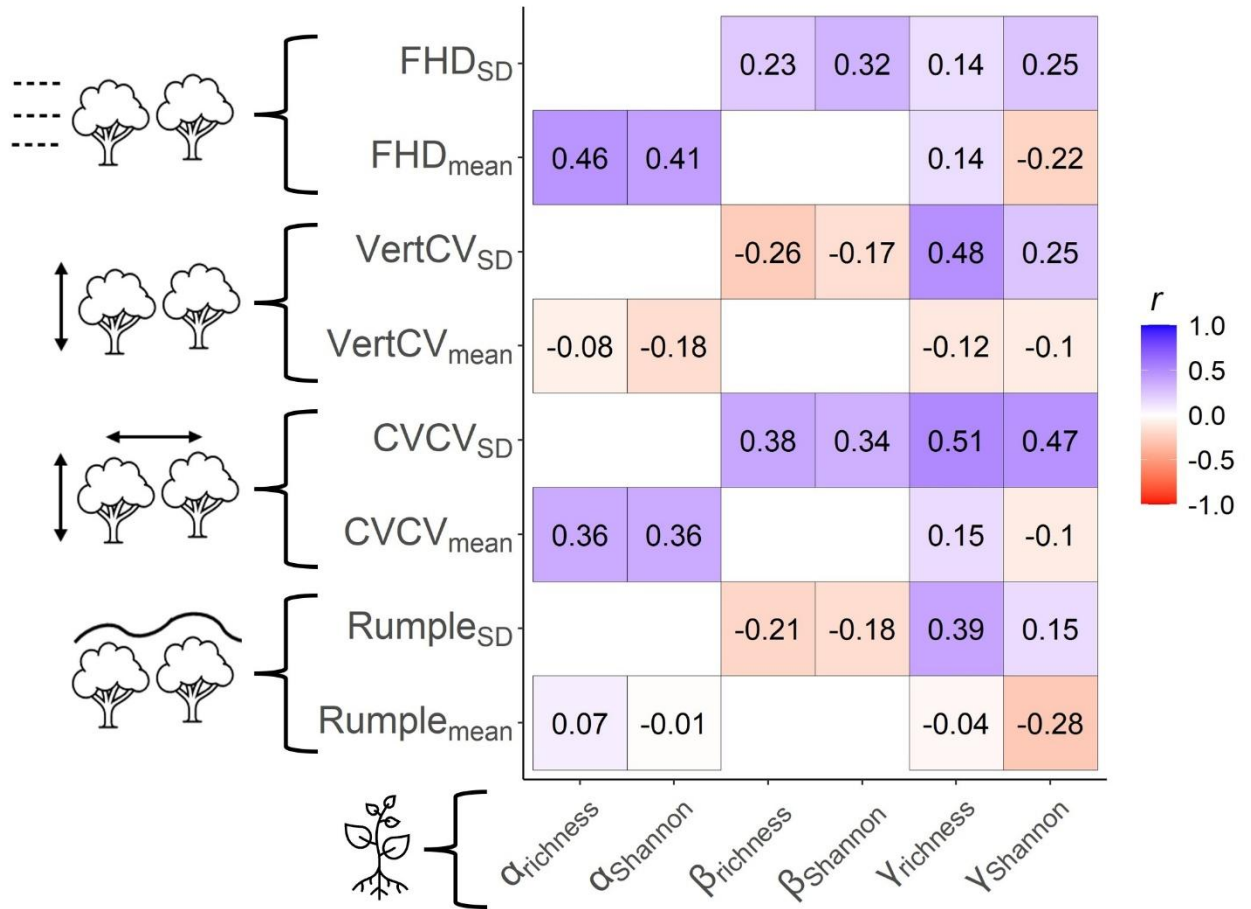
**Supplementary Fig. 3 | Map of National Ecological Observatory Network (NEON) study sites used to assess how ground beetle diversity relates to tree species diversity and forest structural diversity. See Supplementary Table 1 for site descriptions.**



**Supplementary Fig. 4 | Map of National Ecological Observatory Network (NEON) study sites used to assess how understory plant diversity relates to tree species diversity and forest structural diversity.** See Supplementary Table 1 for site descriptions.



**Supplementary Fig. 5 | Iterative random sampling approach used in calculation of diversity indices.** Abbreviations: FSD–forest structural diversity, NLCD–National Land Cover Database.



**Supplementary Fig. 6 | Pearson correlations between site-level structural diversity and understory plant taxonomic diversity indices.** Non-significant correlations ( $p > 0.05$ ) are shown in plain text, while blank cells indicate that no comparison was made.