

Table S 1: Summary statics for all random forest models. Values are means for 100 runs of each model.
 OOB MSE = out-of-bag mean squared error, RMSE = root mean squared error, MAE = mean absolute error, OTU = Operational taxonomic unit.

Model name	OOB MSE	RMSE	MAE	r ²	Marker	Taxonomic Level	Environmental parameters
bact_phylum_env	1444615.5	959.422	804.178	0.466	16S	Phylum	yes
bact_order_env	1244806.8	930.053	811.916	0.539	16S	Order	yes
bact_ITS_order_noenv	1189663.7	967.077	812.353	0.547	16S-ITS	Order	no
bact_order_noenv	1255877.9	926.515	816.699	0.522	16S	Order	no
bact_ITS_order_env	1111697.3	987.116	820.109	0.589	16S-ITS	Order	yes
bact_class_env	1431031.2	1001.965	830.211	0.471	16S	Class	yes
bact_ITS_phylum_env	1177324.2	1047.794	836.237	0.564	16S-ITS	Phylum	yes
bact_ITS_otu_noenv	1384491.8	1009.739	847.294	0.473	16S-ITS	OTU	no
bact_phylum_noenv	1534529.4	1058.541	851.782	0.416	16S	Phylum	no
bact_class_noenv	1527864.0	1055.698	861.749	0.419	16S	Class	no
bact_ITS_otu_env	1320722.5	1037.352	862.051	0.511	16S-ITS	OTU	yes
bact_otu_noenv	1452233.1	1026.675	867.529	0.447	16S	OTU	no
ITS_order_env	1103379.9	1086.955	872.164	0.592	ITS	Order	yes
bact_ITS_phylum_noenv	1258265.1	1093.221	874.592	0.521	16S-ITS	Phylum	no
bact_ITS_class_noenv	1209584.0	1073.396	879.000	0.540	16S-ITS	Class	no
ITS_phylum_env	1150272.6	1117.697	880.792	0.574	ITS	Phylum	yes
ITS_order_noenv	1205103.7	1106.394	887.004	0.541	ITS	Order	no
bact_otu_env	1427895.5	1053.325	889.806	0.472	16S	OTU	yes
bact_ITS_class_env	1133573.6	1091.332	890.940	0.581	16S-ITS	Class	yes
ITS_class_env	995536.1	1123.586	901.115	0.632	ITS	Class	yes
ITS_otu_env	1255170.8	1099.313	903.487	0.536	ITS	OTU	yes
ITS_class_noenv	1100420.9	1137.310	907.111	0.581	ITS	Class	no
ITS_otu_noenv	1355602.1	1130.897	928.257	0.484	ITS	OTU	no
ITS_phylum_noenv	1427807.1	1253.355	996.800	0.457	ITS	Phylum	no