Supplementary Material for

The Fungal Functional Guilds at the Early-Stage Restoration of Subalpine Forest Soils Disrupted by Highway Construction in Southwest China

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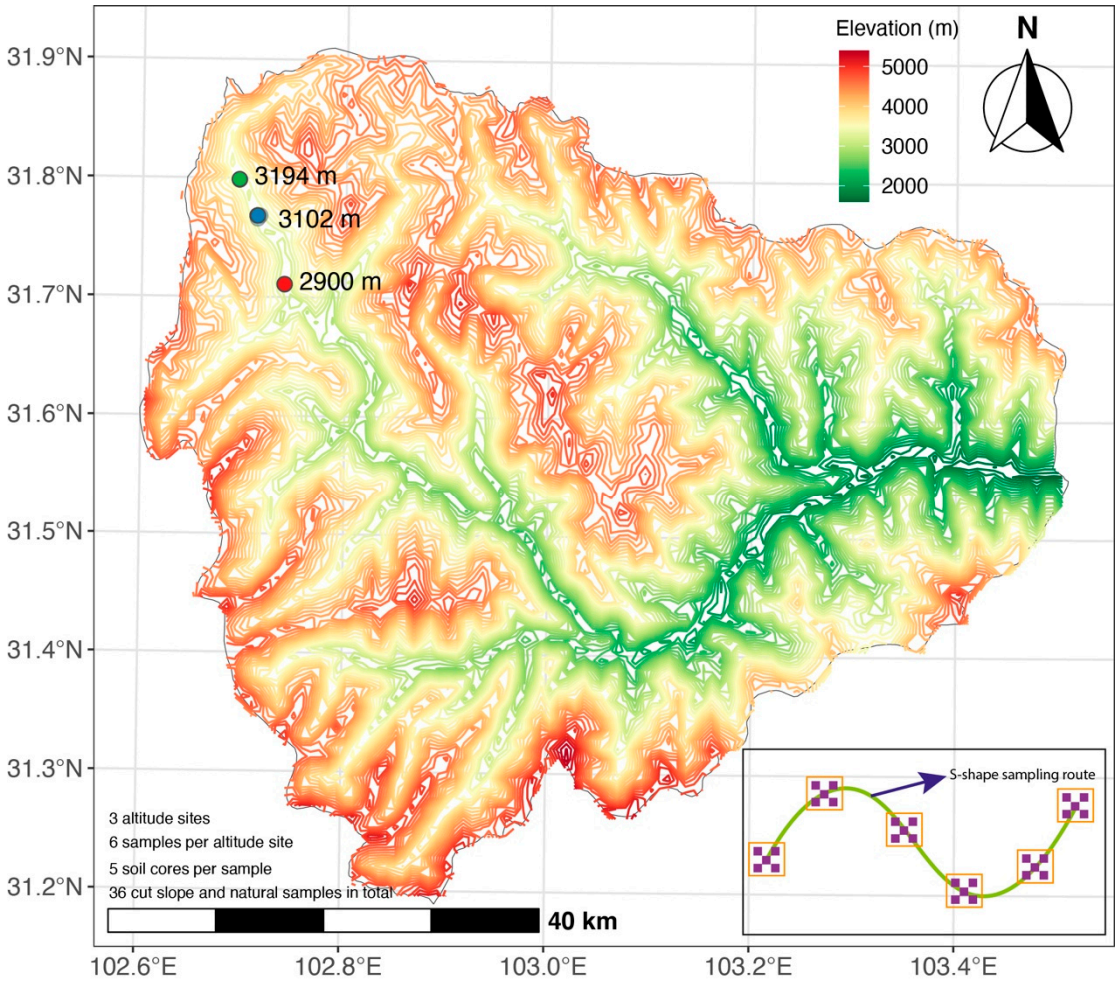

Figure S1. The sampling strategies and the geographic distributions of sampling site in this study. The map was generated through using microgeo R package (https://github.com/ChaonanLi/microgeo)

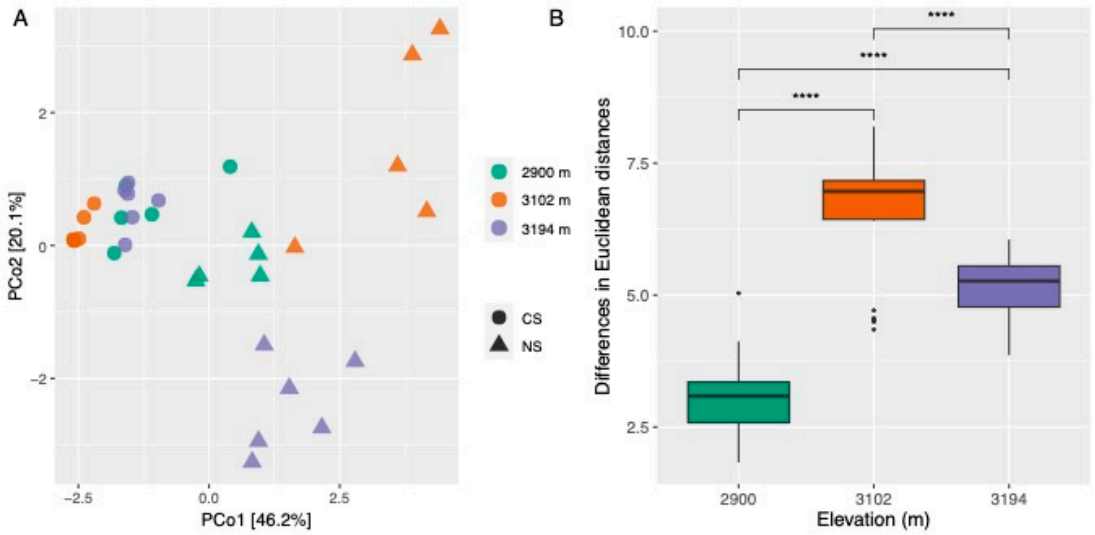

Figure S2. Principal coordinates analysis (PCoA) based on the Euclidean distance for soil properties including conductivity (CD) and soil pH, moisture content (MC), soil temperature (ST), total organic carbon (TOC), ammonium (NH_4^+-N) and nitrate nitrogen (NO_3^--N), total phosphorus (TP) and nitrogen (TN), and soil available phosphorus (SAP) (**A**). Comparisons for the Euclidean distance inferred from soil properties between natural (NS) and cut slope (CS) soils among three altitudes (**B**). The significance in difference among groups in figure (A) is inferred using the analysis of similarity (ANOSIM, **Table S1**), and it is inferred using a Wilcoxon rank sum test in figure (B). *** FDR < 0.001.

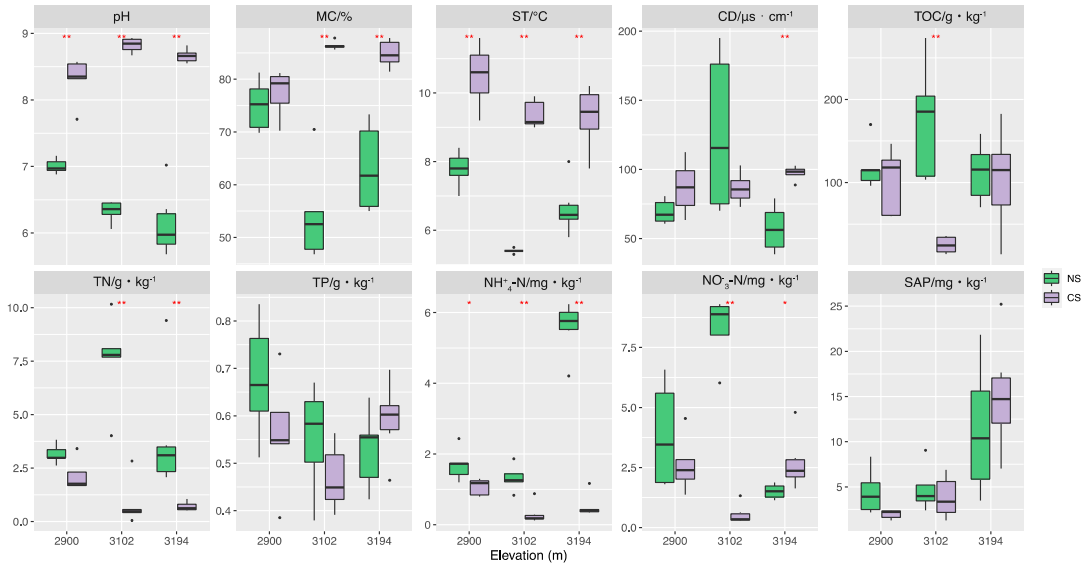

Figure S3. The comparisons for soil properties between natural (NS) and cut slope (CS) soils at each altitude. Significance in difference is inferred using a Wilcoxon rank sum test. CD: conductivity; MC: moisture content; ST: soil temperature; TOC: total organic carbon; TN: total nitrogen; NO_3^--N: nitrate nitrogen; NH_4^+-N: ammonium nitrogen; TP: total phosphorus; SAP: soil available phosphorus. * FDR < 0.05, ** FDR < 0.001.

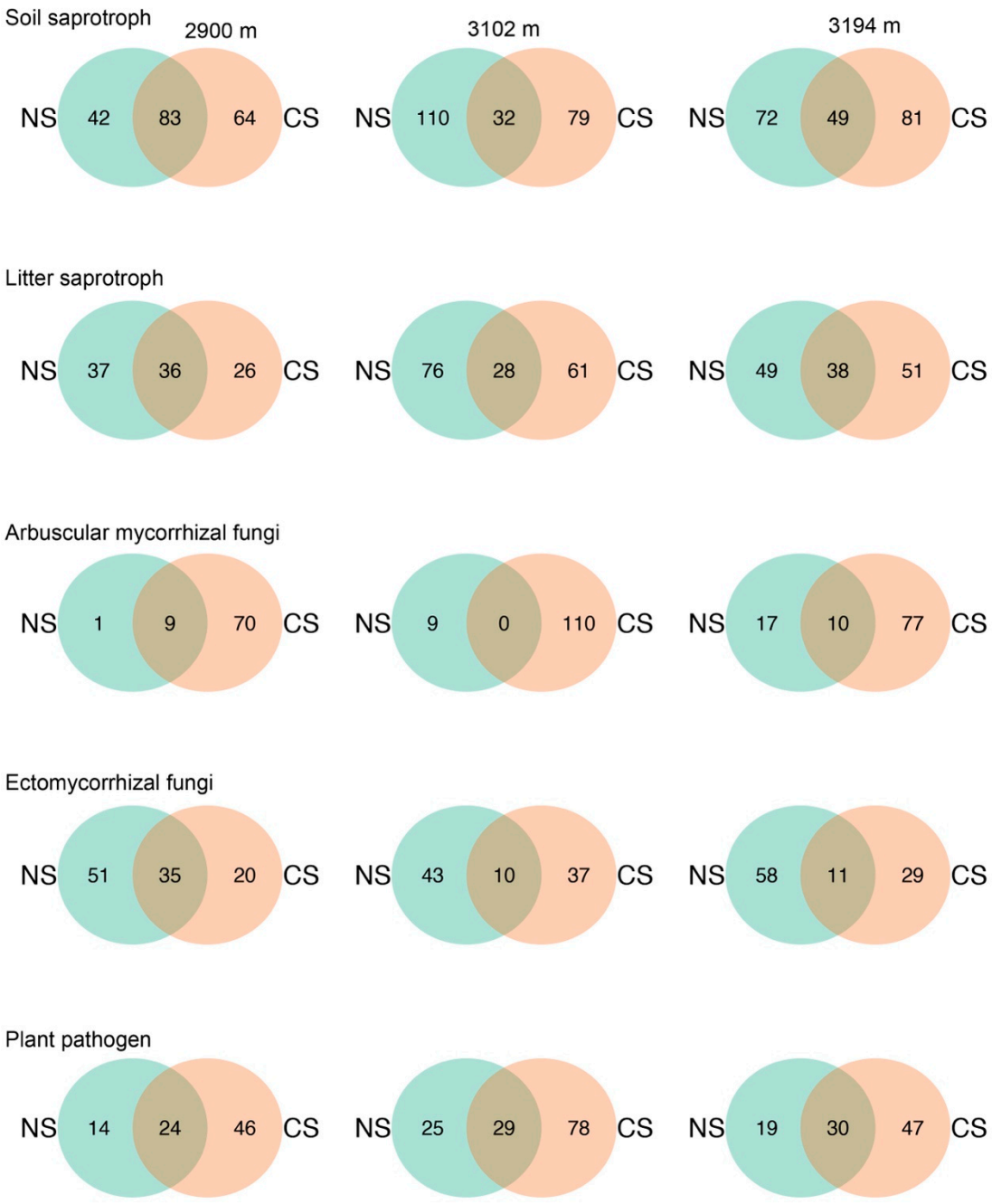

Figure S4. Veen diagrams showing the unique ASV number in natural (NS) and cut slope (CS) soils, respectively, and the shared ASV number between NS and CS. Numbers in each subfigure represent ASV numbers.

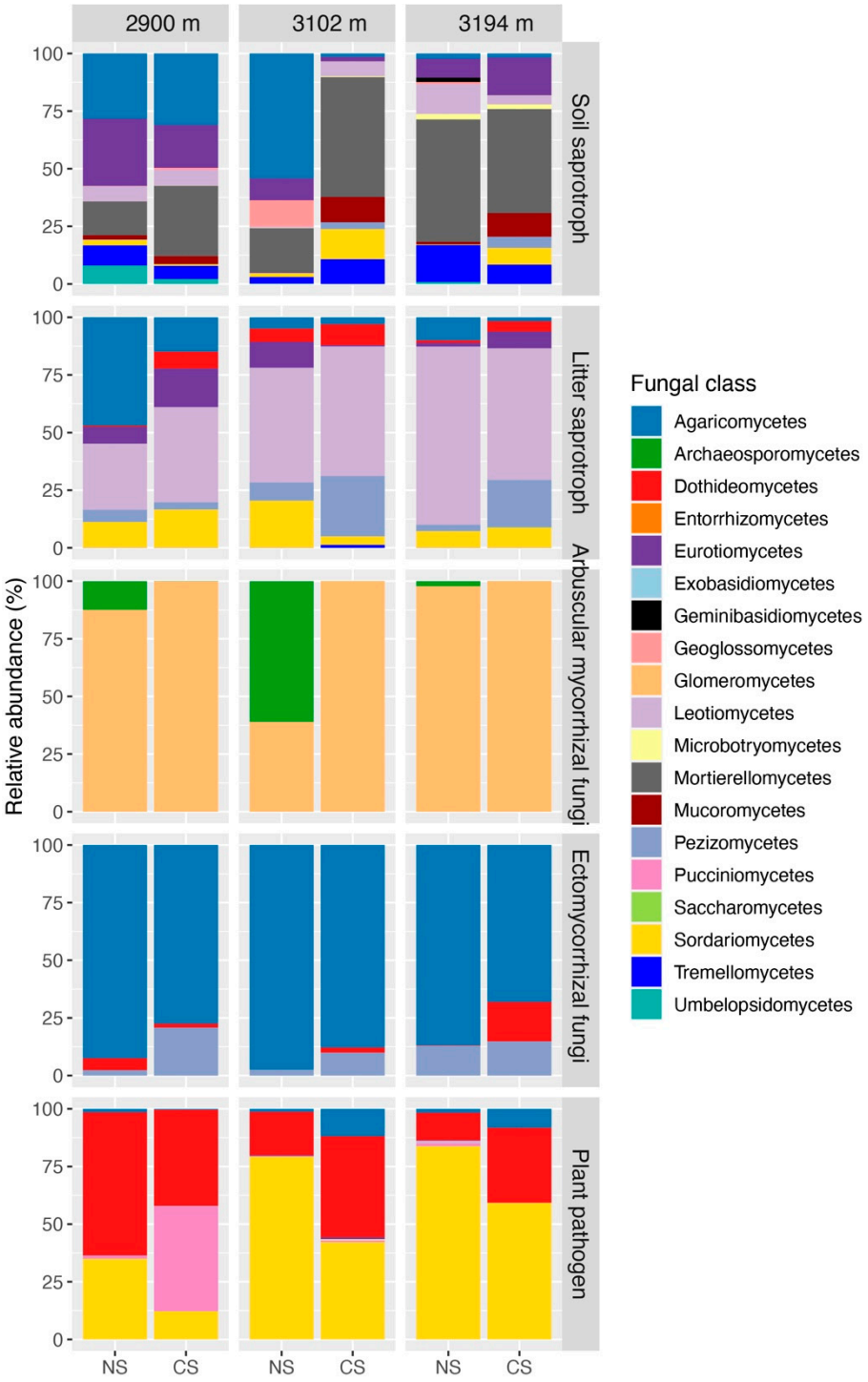

Figure S5. Taxonomic compositions at class-level for soil and litter saprotrophs, arbuscular mycorrhizal and ectomycorrhizal fungi, and plant pathogen. NS: natural soils; CS: cut slope soils.

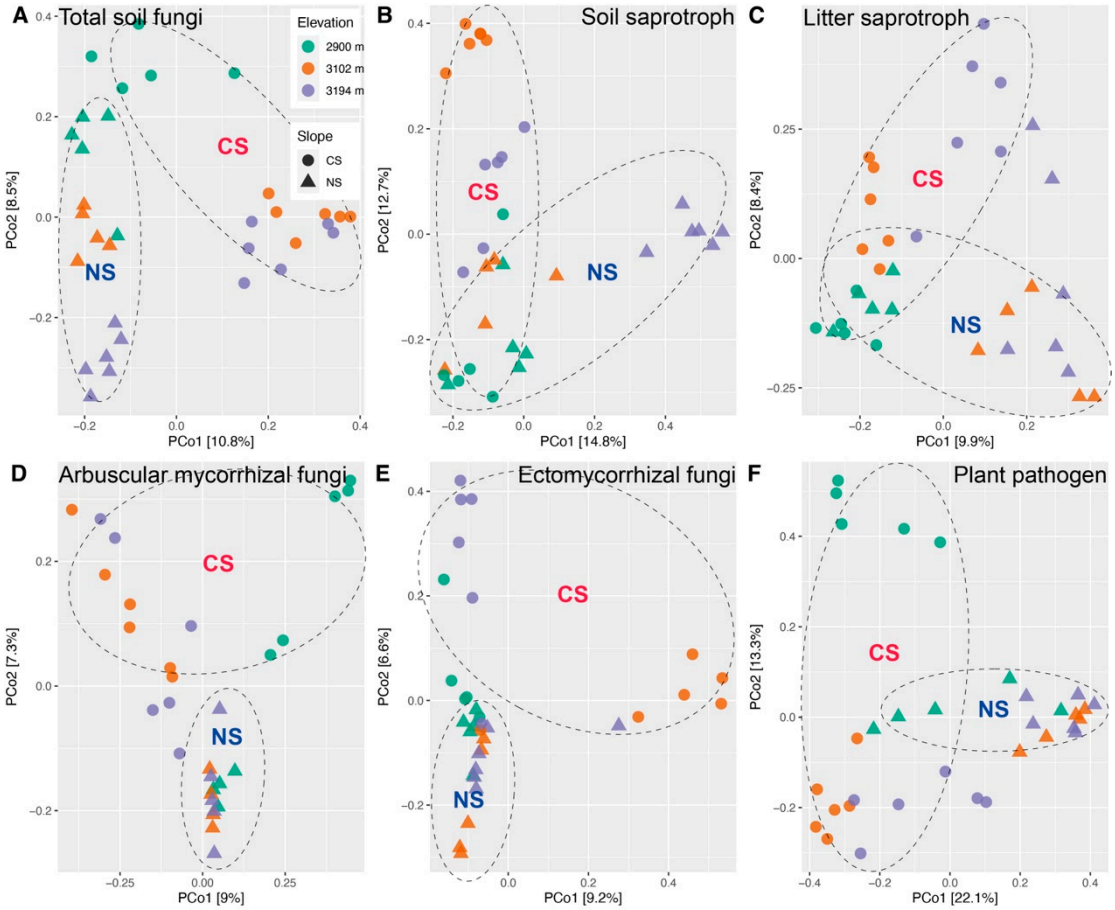

Figure S6. Principal coordinates analysis (PCoA) based on Bray-Curtis distance for the communities of total soil fungi (**A**), soil saprotroph (**B**), litter saprotroph (**C**), arbuscular mycorrhizal (**D**) and ectomycorrhizal fungi (**E**), and plant pathogen (**F**). Significance in difference among groups is inferred through using the analysis of similarity (ANOSIM, **Table S2**). NS: natural soils; CS: cut slope soils.

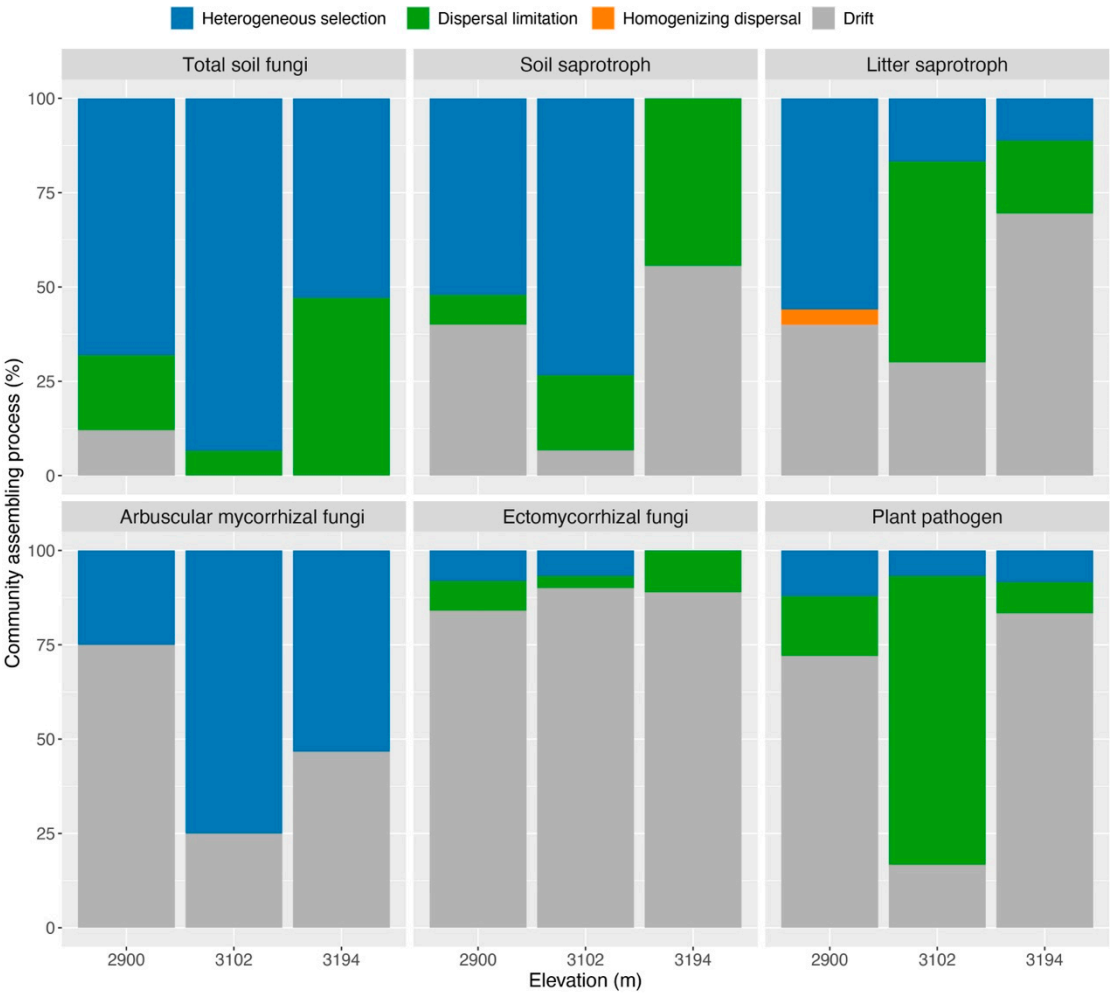

Figure S7. The ecological processes of community assembly for total soil fungi, soil and litter saprotrophs, arbuscular mycorrhizal and ectomycorrhizal fungi, and plant pathogen. NS: natural soils; CS: cut slope soils.

Table S1. The analysis of similarity (ANOSIM) for soil properties based on Euclidean distance. A larger R value represents a larger difference between two groups if the $P < 0.05$.

Comparisons	R	*P*
2900 CS vs 3102 CS	0.675	0.003
2900 CS vs 3194 CS	0.605	0.005
3102 CS vs 3194 CS	0.713	0.007
2900 NS vs 3102 NS	0.644	0.014
2900 NS vs 3194 NS	0.779	0.002
3102 NS vs 3194 NS	0.816	0.001
2900 CS vs 2900 NS	0.620	0.008
3102 CS vs 3102 NS	0.955	0.007
3194 CS vs 3194 NS	0.996	0.004

Table S2. The analysis of similarity (ANOSIM) for communities based on Bray-Curtis distance. A larger R value represents a larger difference between two groups if the $P < 0.05$.

	Comparisons	R	*P*		Comparisons	R	*P*
Total soil fungi	2900 CS vs 3102 CS	0.907	0.002	arbuscular mycorrhizal fungi	2900 CS vs 3102 CS	0.984	0.003
	2900 CS vs 3194 CS	0.835	0.007		2900 CS vs 3194 CS	0.656	0.002
	3102 CS vs 3194 CS	0.554	0.001		3102 CS vs 3194 CS	0.330	0.015
	2900 NS vs 3102 NS	0.604	0.009		2900 NS vs 3102 NS	0.333	0.033
	2900 NS vs 3194 NS	0.899	0.002		2900 NS vs 3194 NS	0.219	0.105
	3102 NS vs 3194 NS	0.861	0.004		3102 NS vs 3194 NS	0.206	0.094
	2900 CS vs 2900 NS	0.552	0.006		2900 CS vs 2900 NS	0.556	0.006
	3102 CS vs 3102 NS	0.996	0.002		3102 CS vs 3102 NS	0.810	0.005
	3194 CS vs 3194 NS	0.931	0.004		3194 CS vs 3194 NS	0.475	0.006
Soil saprotroph	2900 CS vs 3102 CS	0.931	0.008	ectomycorrhizal fungi	2900 CS vs 3102 CS	0.640	0.006
	2900 CS vs 3194 CS	0.397	0.007		2900 CS vs 3194 CS	0.552	0.009
	3102 CS vs 3194 CS	0.507	0.001		3102 CS vs 3194 CS	0.560	0.003
	2900 NS vs 3102 NS	0.448	0.017		2900 NS vs 3102 NS	0.680	0.013
	2900 NS vs 3194 NS	0.915	0.002		2900 NS vs 3194 NS	0.629	0.007
	3102 NS vs 3194 NS	0.901	0.002		3102 NS vs 3194 NS	0.683	0.003
	2900 CS vs 2900 NS	0.168	0.044		2900 CS vs 2900 NS	0.608	0.007
	3102 CS vs 3102 NS	0.901	0.003		3102 CS vs 3102 NS	0.541	0.005
	3194 CS vs 3194 NS	0.772	0.003		3194 CS vs 3194 NS	0.589	0.003
litter saprotroph	2900 CS vs 3102 CS	0.593	0.003	plant pathogen	2900 CS vs 3102 CS	0.950	0.003
	2900 CS vs 3194 CS	0.664	0.003		2900 CS vs 3194 CS	0.973	0.004
	3102 CS vs 3194 CS	0.504	0.007		3102 CS vs 3194 CS	0.535	0.002
	2900 NS vs 3102 NS	0.552	0.007		2900 NS vs 3102 NS	0.444	0.019
	2900 NS vs 3194 NS	0.531	0.003		2900 NS vs 3194 NS	0.575	0.006
	3102 NS vs 3194 NS	0.407	0.007		3102 NS vs 3194 NS	0.376	0.014
	2900 CS vs 2900 NS	-0.060	0.671		2900 CS vs 2900 NS	0.944	0.008
	3102 CS vs 3102 NS	0.800	0.002		3102 CS vs 3102 NS	0.907	0.004
	3194 CS vs 3194 NS	0.431	0.002		3194 CS vs 3194 NS	0.630	0.001