

### Supplemental Tables

Table S1. Site averages for age, climate, and environmental characteristics.  
DOC denotes dissolved organic carbon, SOM denotes soil organic material

	A	B	C	D
<u>Climate</u>				
Mean Temp (C)	4.82	6.06	6.49	7.65
Mean Precipitation (cm)	91.87	93.28	92.81	86.63
Ambient N dep (kg/ha)	5.89	6.07	7.37	7.37
<u>Environment</u>				
Leaf Litter [C] (g/kg)	458	456	453	455
Leaf Litter C:N	63.68	57.06	52.91	43.41
Leaf Litter Mass (g)	412.7	396.3	591	550.2
Extractable DOC (mg/L)	5.5	2.79	5.85	9.95
Extractable NO <sub>3</sub> <sup>-</sup> (mg/L)	0.08	0.55	0.86	0.92
SOM C:N	13.12	22.55	15.9	11.42
SOM [N] (mg/g)	1.84	1.36	1.83	1.73
pH	4.55	4.7	4.41	4.61
Moisture Content (%)	23	24	18	14



**Table S3.** Pearson correlation of fungal and actinobacterial genes to the first PCO axis. Italicized genes/enzymes have the strongest correlation values

<b>Fungal Genes</b>				<b>Actinobacterial Genes</b>			
	Ave Corel	Count	StErr		Ave Corel	Count	Sterr
<b>Starch</b>	<b>-0.46</b>	<b>112</b>	<b>0.02</b>	<b>Starch</b>	<b>-0.38</b>	<b>160</b>	<b>0.02</b>
amyA	-0.48	55	0.03	amyA	-0.38	115	0.03
glucoamylase	-0.49	15	0.05	cda	-0.39	8	0.09
Glucose_oxidase	-0.45	12	0.05	glucoamylase	-0.18	4	0.27
glucoamylase	-0.41	30	0.05	npIT	-0.30	2	0.43
<b>Hemicellulose</b>	<b>-0.44</b>	<b>279</b>	<b>0.02</b>	pulA	-0.42	31	0.04
alpha_galactosidase	-0.43	28	0.05	<b>Hemicellulose</b>	<b>-0.43</b>	<b>92</b>	<b>0.03</b>
ara	-0.38	55	0.04	ara	-0.46	49	0.04
endopolygalacturonase	-0.40	27	0.06	mannanase	-0.25	9	0.09
exopolygalacturonase	-0.47	24	0.04	xylA	-0.45	28	0.05
pec	-0.49	58	0.03	xylanase	-0.40	6	0.09
pme	-0.44	15	0.09	<b>Cellulose</b>	<b>-0.45</b>	<b>40</b>	<b>0.04</b>
rgh	-0.47	35	0.04	cellobiase	-0.44	28	0.06
xylanase	-0.45	36	0.04	<i>endoglucanase</i>	<i>-0.65</i>	4	<i>0.12</i>
<b>Cellulose</b>	<b>-0.44</b>	<b>200</b>	<b>0.02</b>	exoglucanase	-0.38	8	0.06
cellobiase	-0.49	79	0.02	<b>Chitin</b>	<b>-0.43</b>	<b>126</b>	<b>0.03</b>
endoglucanase	-0.38	37	0.05	acetylglucosaminidase	-0.46	39	0.04
exoglucanase	-0.42	78	0.03	endochitinase	-0.45	69	0.03
exopolygalacturonase	-0.42	6	0.11	exochitinase	-0.25	18	0.10
<b>Chitin</b>	<b>-0.39</b>	<b>214</b>	<b>0.02</b>	<b>lignin</b>	<b>-0.44</b>	<b>64</b>	<b>0.03</b>
acetylglucosaminidase	-0.33	13	0.10	CDH	-0.44	32	0.05
chitin_deacetylase	-0.42	16	0.04	<i>glx</i>	<i>-0.56</i>	4	<i>0.11</i>
cutinase	-0.39	40	0.04	mdlA	-0.44	18	0.05
endochitinase	-0.39	115	0.03	per_bac	-0.33	6	0.12
<i>exochitinase</i>	<i>-0.61</i>	7	<i>0.06</i>	<i>phenol_oxidase</i>	<i>-0.68</i>	2	<i>0.15</i>
mannanase	-0.30	23	0.05				
<b>Lignin</b>	<b>-0.41</b>	<b>311</b>	<b>0.02</b>				
glx	-0.38	35	0.06				
lip	-0.39	26	0.06				
mnp	-0.39	29	0.05				
peroxidase	-0.40	73	0.03				
phenol_oxidase	-0.42	148	0.02				

Table S4: SIMPER results displaying the contribution of genes to the dissimilarity between ambient and N deposition communities

Dikarya. Total dissimilarity 11.5%					Actinobacteria . Total dissimilarity 14.2				
Gene	Substrate	Response	Diss/SD	Contrib%	Gene	Substrate	Response	Diss/SD	Contrib%
exochitinase	Chitin	-	1.66	8.14	phenol oxidase	Lignin	-	0.69	10.6
rgh	Hemicellulose	+	1.34	4.98	glucoamylase	Starch	+	1.25	8.92
acetylglucosaminidase	Chitin	-	1.19	4.77	endoglucanase	Cellulose	-	0.93	7.38
cellobiase	Cellulose	-	1.45	4.51	per bac	Lignin	+	1.49*	6.43
chitin deacetylase	Chitin	-	1.07	4.48	cda	Starch	-	1.11	5.36
endopolygalacturonase	Cellulose	-	1.46	4.24	mdlA	Lignin	-	1.03	4.95
pec	Hemicellulose	-	1.36	4.09	pulA	Starch	-	1.37*	4.72
xylanase	Hemicellulose	-	1.25	4.08	endochitinase	Chitin	-	1.23	4.71
glucoamylase	starch	-	1.44	4.07	glx	Lignin	-	0.73	4.68
AmyA	starch	-	1.45	3.89	acetylglucosaminidase	Chitin	-	1.1	4.56
pme	Hemicellulose	-	1.38	3.87	mannanase	Hemicellulose	-	1.19	4.42
alpha galactosidase	Hemicellulose	-	1.31	3.81	xylanase	Hemicellulose	-	1.15	4.31
exopolygalacturonase	Hemicellulose	-	1.18	3.68	exochitinase	Chitin	-	1.21	4.2
mnp	lignin	-	1.2	3.44	cellobiase	Cellulose	-	1.14	4.17
phenol oxidase	lignin	-	1.21	3.42	ara	Hemicellulose	-	0.96	4.1
exopolygalacturonase	Cellulose	-	1.35	3.41	exoglucanase	Cellulose	+	1.3	4.01
glx	lignin	-	1.41	3.4	xla	Hemicellulose	-	1.22	3.97
endochitinase	Chitin	-	1.28	3.33					
exoglucanase	Cellulose	-	1.33	3.26					
endoglucanase	Cellulose	-	1.38	3.2					
glucose_oxidase	starch	-	1.22	3.18					
peroxidase	lignin	-	1.2	3.04					
lip	lignin	-	1.07	3.03					