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**Table S7**. Outer model of partial least squares path models (PLS-PM) under forest conversion. pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium, abundance: total nematode abundance, *H*: Shannon wiener index, *J*: evenness index, Composition: the PCoA1 of nematode composition, SI: structure index, Ftotal: total energy flow in the nematode food web, Uniformity: flow uniformity in the nematode food web.

**Table S8**. Inner summary of partial least squares path models (PLS-PM) under forest conversion.

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**Figure S1**. Faunal analysis of weighted soil nematodes under forest conversion.

**Figure S2**.Pearson correlations analysis of nematode abundance and ecological indices with soil chemical properties. pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium, MI: maturity index, NCR: nematode channel ratio, SI: structure index, EI: enrichment index, *H*: Shannon wiener index, *J*: evenness index, *λ*: Simpson’s dominance index, Dtotal: total nematode abundance, Dompr: omnivores-predators abundance, DHe: herbivores abundance, DFu: fungivores abundance, Dba: bacterivores abundance.

# Supplemental Tables

**Table S1**. Abundance (individuals per 100 g of dry soil) of soil nematode genera in five forest types.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Genus | Guilds | Forest | Peach | Berry | Oil | Fir | *p*-value |
| *Protorhabditis* | Ba1 | 7.98 | 187.91 | 0.00 | 0.00 | 24.49 | ≤0.05 |
| *Rhabditis* | Ba1 | 0.00 | 54.98 | 0.00 | 0.00 | 3.59 | ≤0.05 |
| *Rhabditoides* | Ba1 | 6.32 | 67.38 | 0.00 | 0.00 | 0.00 | ≤0.05 |
| *Acrobeloides* | Ba2 | 71.76 | 363.85 | 177.98 | 771.54 | 107.84 | ≤0.05 |
| *Eucephalobus* | Ba2 | 20.89 | 30.89 | 10.56 | 6.81 | 30.10 | ≤0.05 |
| *Eumonhystera* | Ba2 | 0.00 | 0.00 | 0.00 | 2.77 | 0.00 | ≤0.05 |
| *Heterocephalobus* | Ba2 | 0.00 | 0.00 | 0.00 | 2.77 | 0.00 | ≤0.05 |
| *Plectus* | Ba2 | 220.68 | 124.37 | 45.83 | 43.52 | 56.56 | ≤0.05 |
| *Wilsonema* | Ba2 | 10.62 | 3.64 | 3.33 | 8.09 | 2.21 | 0.46 |
| *Microlaimus* | Ba3 | 63.21 | 3.92 | 10.38 | 18.62 | 0.00 | 0.32 |
| *Prismatolaimus* | Ba3 | 456.60 | 131.09 | 316.93 | 100.76 | 49.79 | ≤0.05 |
| *Rhabdolaimus* | Ba3 | 4.30 | 101.07 | 14.47 | 125.85 | 90.16 | ≤0.05 |
| *Alaimus* | Ba4 | 2.66 | 0.00 | 0.00 | 4.04 | 0.00 | 0.21 |
| *Aphelenchoides* | Fu2 | 81.35 | 147.80 | 98.50 | 78.93 | 193.17 | ≤0.05 |
| *Aphelenchus* | Fu2 | 0.00 | 0.00 | 12.59 | 0.00 | 0.00 | 0.13 |
| *Ditylenchus* | Fu2 | 23.55 | 37.98 | 48.94 | 87.34 | 35.57 | ≤0.05 |
| *Filenchus* | Fu2 | 0.00 | 5.79 | 19.79 | 13.09 | 2.56 | 0.27 |
| *Dorylaimellus* | Fu4 | 2.66 | 3.64 | 0.00 | 29.15 | 1.80 | ≤0.05 |
| *Tylencholaimus* | Fu4 | 140.06 | 0.00 | 6.66 | 24.15 | 4.41 | ≤0.05 |
| *Tripyla* | Pr3 | 28.59 | 3.64 | 3.33 | 0.00 | 9.47 | ≤0.05 |
| *Clarkus* | Pr4 | 0.00 | 0.00 | 7.81 | 0.00 | 0.00 | 0.17 |
| *Aporcelaimellus* | Pr5 | 2.66 | 2.89 | 3.33 | 0.00 | 3.59 | 0.67 |
| *Eudorylaimus* | Om4 | 40.12 | 0.00 | 0.00 | 7.13 | 0.00 | ≤0.05 |
| *Microdorylaimus* | Om4 | 6.32 | 7.56 | 3.33 | 4.36 | 15.67 | ≤0.05 |
| *Prodorylaimus* | Om4 | 4.30 | 0.00 | 3.33 | 4.04 | 0.00 | 0.43 |
| *Thonus* | Om4 | 30.23 | 18.01 | 3.33 | 43.52 | 6.62 | ≤0.05 |
| *Nygolaimus* | Om5 | 2.66 | 5.79 | 7.23 | 21.49 | 0.00 | ≤0.05 |
| *Lelenchus* | He2 | 59.44 | 3.92 | 41.53 | 2.77 | 47.24 | ≤0.05 |
| *Criconemella* | He3 | 0.00 | 0.00 | 0.00 | 8.73 | 0.00 | 0.18 |
| *Helicotylenchus* | He3 | 111.60 | 0.00 | 484.41 | 0.00 | 17.41 | ≤0.05 |
| *Paratylenchus* | He3 | 0.00 | 0.00 | 0.00 | 0.00 | 2.21 | 0.15 |
| *Trophurus* | He3 | 0.00 | 0.00 | 20.37 | 0.00 | 4.35 | ≤0.05 |

**Table S2.** Principal coordinate analysis (PCoA) of soil nematode community composition.

|  |  |  |
| --- | --- | --- |
| Forest types | PCoA1 | PCoA2 |
| Oil1 | -0.35 | -0.13 |
| Oil2 | -0.33 | -0.18 |
| Oil3 | -0.22 | -0.31 |
| Oil4 | -0.30 | -0.19 |
| Berry1 | 0.17 | -0.14 |
| Berry2 | 0.26 | -0.09 |
| Berry3 | 0.32 | -0.12 |
| Berry4 | 0.26 | -0.11 |
| Peach1 | -0.21 | 0.12 |
| Peach2 | -0.18 | -0.03 |
| Peach3 | -0.17 | 0.09 |
| Peach4 | -0.15 | 0.05 |
| Fir1 | -0.03 | 0.23 |
| Fir2 | -0.11 | 0.25 |
| Fir3 | -0.16 | 0.26 |
| Fir4 | -0.08 | 0.21 |
| Froest1 | 0.35 | 0.00 |
| Froest2 | 0.34 | 0.03 |
| Froest3 | 0.26 | 0.03 |
| Froest4 | 0.31 | 0.02 |
| Variance explained | 44% | 18% |
| Cumulative variance | 44% | 62% |

**Table S3.** Summary table of redundancy analysis (RDA) under soil nematode genera

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Statistic | Axis 1 | Axis 2 | Axis 3 | Axis 4 |
| Eigenvalues | 0.52 | 0.22 | 0.14 | 0.04 |
| Explained variation (cumulative) | 51.66 | 74.08 | 87.69 | 91.87 |
| Pseudo-canonical correlation | 0.98 | 0.98 | 0.99 | 0.99 |
| Explained fitted variation (cumulative) | 54.27 | 77.82 | 92.12 | 96.51 |

**Table S4.** Forward selection results of redundancy analysis (RDA) under soil nematode genera (≥50%, top 16).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Explains % | Contribution % | pseudo-F | *p*-value |
| DOC | 43.1 | 45.3 | 13.6 | ≤0.05 |
| TK | 14.9 | 15.7 | 6 | ≤0.05 |
| SOC | 12.8 | 13.5 | 7 | ≤0.05 |
| TP | 7 | 7.4 | 4.7 | ≤0.05 |
| Available P | 3.6 | 3.8 | 2.7 | ≤0.05 |
| TN | 3.5 | 3.7 | 3.1 | ≤0.05 |
| MBN | 3 | 3.2 | 3 | ≤0.05 |
| DON | 2.8 | 3 | 3.4 | ≤0.05 |
| pH | 1.4 | 1.4 | 1.7 | 0.16 |
| Available N | 1.2 | 1.2 | 1.6 | 0.21 |
| Available K | 1 | 1 | 1.4 | 0.24 |
| MBC | 0.9 | 0.9 | 1.3 | 0.28 |

Note: pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium.

**Table S5.** Summary table of redundancy analysis (RDA) under soil nematode guilds.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Statistic | Axis 1 | Axis 2 | Axis 3 | Axis 4 |
| Eigenvalues | 0.28 | 0.21 | 0.12 | 0.08 |
| Explained variation (cumulative) | 28.32 | 49.18 | 61.55 | 69.75 |
| Pseudo-canonical correlation | 0.98 | 0.97 | 0.94 | 0.90 |
| Explained fitted variation (cumulative) | 33.76 | 58.62 | 73.36 | 83.13 |

**Table S6.** Forward selection results of redundancy analysis (RDA) under soil nematode guilds.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Explains % | Contribution % | pseudo-F | *p*-value |
| SOC | 18.1 | 21.6 | 4 | ≤0.05 |
| DOC | 15.2 | 18.1 | 3.9 | ≤0.05 |
| MBC | 11.7 | 13.9 | 3.4 | ≤0.05 |
| TK | 9.1 | 10.9 | 3 | ≤0.05 |
| MBN | 5.6 | 6.7 | 1.9 | ≤0.05 |
| TP | 4.9 | 5.8 | 1.8 | ≤0.05 |
| DON | 4.6 | 5.5 | 1.8 | ≤0.05 |
| Available P | 5.3 | 6.4 | 2.3 | ≤0.05 |
| TN | 3.2 | 3.9 | 1.5 | 0.18 |
| pH | 3.4 | 4 | 1.6 | 0.17 |
| Available N | 1.3 | 1.5 | 0.6 | 0.72 |
| Available K | 1.4 | 1.7 | 0.6 | 0.65 |

Note: pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium.

**Table S7.** Outer model of partial least squares path models (PLS-PM) after forest conversion.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Block | Weight | Loading | Communality | Redundancy |
| SOC | Carbon | 0.60 | 0.87 | 0.76 | 0.00 |
| MBC | Carbon | -0.05 | -0.17 | 0.03 | 0.00 |
| DOC | Carbon | 0.54 | 0.87 | 0.76 | 0.00 |
| TN | Nitrogen | 0.37 | 0.99 | 0.99 | 0.00 |
| MBN | Nitrogen | 0.14 | 0.31 | 0.10 | 0.00 |
| DON | Nitrogen | 0.21 | 0.85 | 0.73 | 0.00 |
| Available N | Nitrogen | 0.42 | 0.98 | 0.96 | 0.00 |
| TP | Phosphorus | 0.58 | 0.99 | 0.98 | 0.00 |
| Available P | Phosphorus | 0.43 | 0.98 | 0.97 | 0.00 |
| TK | Potassium | 0.81 | 0.93 | 0.86 | 0.00 |
| Available K | Potassium | 0.39 | 0.64 | 0.41 | 0.00 |
| Abundance | Abundance | 1.00 | 1.00 | 1.00 | 0.49 |
| *H* | Diversity | 0.54 | 0.95 | 0.90 | 0.71 |
| *J* | Diversity | 0.52 | 0.95 | 0.90 | 0.70 |
| Composition | Composition | 1.00 | 1.00 | 1.00 | 0.95 |
| SI | Structure | 1.00 | 1.00 | 1.00 | 0.86 |
| Ftotal | Energy | 1.00 | 1.00 | 1.00 | 0.71 |
| Uniformity | Uniformity | 1.00 | 1.00 | 1.00 | 0.69 |

Note: pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium, abundance: total nematode abundance, *H*: Shannon wiener index, *J*: evenness index, Composition: the PCoA1 of nematode composition, SI: structure index, Ftotal: total energy flow in the nematode food web, Uniformity: flow uniformity in the nematode food web.

**Table S8.** Inner summary of partial least squares path models (PLS-PM) after forest conversion.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Type | R2 | Block\_Communality | Mean\_Redundancy | AVE |
| Carbon | Exogenous | 0.00 | 0.52 | 0.00 | 0.52 |
| Nitrogen | Exogenous | 0.00 | 0.69 | 0.00 | 0.69 |
| Phosphorus | Exogenous | 0.00 | 0.98 | 0.00 | 0.98 |
| Potassium | Exogenous | 0.00 | 0.64 | 0.00 | 0.64 |
| Abundance | Endogenous | 0.49 | 1.00 | 0.49 | 1.00 |
| Diversity | Endogenous | 0.78 | 0.90 | 0.70 | 0.90 |
| Composition | Endogenous | 0.95 | 1.00 | 0.95 | 1.00 |
| Structure | Endogenous | 0.86 | 1.00 | 0.86 | 1.00 |
| Energy | Endogenous | 0.71 | 1.00 | 0.71 | 1.00 |
| Uniformity | Endogenous | 0.69 | 1.00 | 0.69 | 1.00 |

**Table S9.** Inner model of partial least squares path models (PLS-PM) after forest conversion.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Estimate | Std. Error | t value | *p*-value |
|  | Intercept | 0.00 | 0.18 | 0.00 | 1.00 |
| Abundance | Carbon | -0.69 | 0.55 | -1.24 | 0.24 |
|  | Nitrogen | 0.91 | 0.33 | 2.74 | ≤0.05 |
|  | Phosphorus | 0.13 | 0.24 | 0.53 | 0.60 |
|  | Potassium | -0.60 | 0.34 | -1.78 | 0.10 |
|  | Intercept | 0.00 | 0.12 | 0.00 | 1.00 |
| Diversity | Carbon | 1.63 | 0.26 | 6.32 | ≤0.05 |
|  | Nitrogen | -0.47 | 0.22 | -2.12 | 0.06 |
|  | Phosphorus | 0.01 | 0.16 | 0.05 | 0.96 |
|  | Potassium | 1.13 | 0.20 | 5.64 | ≤0.05 |
|  | Intercept | 0.00 | 0.06 | 0.00 | 1.00 |
| Composition | Carbon | 0.68 | 0.12 | 5.49 | ≤0.05 |
|  | Nitrogen | -0.19 | 0.11 | -1.81 | 0.09 |
|  | Phosphorus | 0.21 | 0.08 | 2.80 | ≤0.05 |
|  | Potassium | -0.53 | 0.10 | -5.42 | ≤0.05 |
|  | Intercept | 0.00 | 0.10 | 0.00 | 1.00 |
| Structure | Carbon | 0.46 | 0.21 | 2.20 | ≤0.05 |
|  | Nitrogen | 0.18 | 0.18 | 1.00 | 0.37 |
|  | Phosphorus | -0.20 | 0.13 | -1.62 | 0.13 |
|  | Potassium | -0.36 | 0.16 | -2.24 | ≤0.05 |
|  | Intercept | 0.00 | 0.14 | 0.00 | 1.00 |
|  | Abundance | 0.86 | 0.16 | 5.26 | ≤0.05 |
| Energy | Diversity | 0.46 | 0.16 | 2.89 | ≤0.05 |
|  | Composition | -0.05 | 0.26 | -0.19 | 0.85 |
|  | Structure | 0.09 | 0.27 | 0.34 | 0.74 |
|  | Intercept | 0.00 | 0.14 | 0.00 | 1.00 |
|  | Abundance | -0.53 | 0.17 | -3.15 | ≤0.05 |
| Uniformity | Diversity | -0.15 | 0.16 | -0.90 | 0.38 |
|  | Composition | -0.42 | 0.26 | -1.61 | 0.13 |
|  | Structure | 1.20 | 0.27 | 4.39 | ≤0.05 |

**Table S10.** The direct and indirect effects of each index in partial least squares path models (PLS-PM) after forest conversion.

|  |  |  |  |
| --- | --- | --- | --- |
| Relationships | Direct | Indirect | Total |
| Carbon -> Abundance | -0.69 | 0.00 | -0.69 |
| Carbon -> Diversity | 1.63 | 0.00 | 1.63 |
| Carbon -> Composition | 0.68 | 0.00 | 0.68 |
| Carbon -> Structure | 0.46 | 0.00 | 0.46 |
| Carbon -> Energy | 0.00 | 0.28 | 0.28 |
| Carbon -> Uniformity | 0.00 | 0.66 | 0.66 |
| Nitrogen -> Abundance | 0.91 | 0.00 | 0.91 |
| Nitrogen -> Diversity | -0.47 | 0.00 | -0.47 |
| Nitrogen -> Composition | -0.19 | 0.00 | -0.19 |
| Nitrogen -> Structure | 0.18 | 0.00 | 0.18 |
| Nitrogen -> Energy | 0.00 | 0.60 | 0.60 |
| Nitrogen -> Uniformity | 0.00 | -0.12 | -0.12 |
| Phosphorus -> Abundance | 0.13 | 0.00 | 0.13 |
| Phosphorus -> Diversity | 0.01 | 0.00 | 0.01 |
| Phosphorus -> Composition | 0.21 | 0.00 | 0.21 |
| Phosphorus -> Structure | -0.20 | 0.00 | -0.20 |
| Phosphorus -> Energy | 0.00 | 0.08 | 0.08 |
| Phosphorus -> Uniformity | 0.00 | -0.40 | -0.40 |
| Potassium -> Abundance | -0.80 | 0.00 | -0.80 |
| Potassium -> Diversity | 1.13 | 0.00 | 1.13 |
| Potassium -> Composition | -0.53 | 0.00 | -0.53 |
| Potassium -> Structure | -0.36 | 0.00 | -0.36 |
| Potassium -> Energy | 0.00 | -0.17 | -0.17 |
| Potassium -> Uniformity | 0.00 | 0.04 | 0.04 |
| Abundance -> Energy | 0.86 | 0 | 0.86 |
| Abundance -> Uniformity | -0.53 | 0 | -0.53 |
| Diversity -> Energy | 0.46 | 0.00 | 0.46 |
| Diversity -> Uniformity | -0.15 | 0.00 | -0.15 |
| Composition -> Energy | -0.05 | 0.00 | -0.05 |
| Composition -> Uniformity | -0.42 | 0.00 | -0.42 |
| Structure -> Energy | 0.09 | 0.00 | 0.09 |
| Structure -> Uniformity | 1.20 | 0.00 | 1.20 |

# Supplemental Figures

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**Figure S1.** Faunal analysis of weighted soil nematodes under forest conversion.

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**Figure S2.** Pearson correlations analysis of nematode abundance and ecological indices with soil chemical properties.pH: soil pH, SOC: soil organic carbon, DOC: dissolved organic carbon, MBC: microbial biomass carbon, TN: total nitrogen, Available N: alkali-hydrolyzale nitrogen, DON: dissolved organic nitrogen, MBN: microbial biomass nitrogen, TP: total phosphorus, Available P: available phosphorus, TK: total potassium, Available K: available potassium, MI: maturity index, NCR: nematode channel ratio, SI: structure index, EI: enrichment index, *H*: Shannon wiener index, *J*: evenness index, *λ*: Simpson’s dominance index, Dtotal: total nematode abundance, Dompr: omnivores-predators abundance, DHe: herbivores abundance, DFu: fungivores abundance, Dba: bacterivores abundance.