## Supplementary information

**Table S1.** Basic characteristics of *Metasequoia glyptostroboides* plantations of different ages.

| Stand age (year) | Mean DBH (cm) | Mean tree height (m) | Stand density (individuals/ha) | Canopy closure (%) |
|---|---|---|---|---|
| 7 | 10.5±0.4 | 8.1±0.8 | 2942 | 80 |
| 16 | 20.9±1.8 | 20.1±0.8 | 1175 | 70 |
| 21 | 25.7±1.4 | 22.4±1.4 | 1225 | 77 |
| 26 | 27.0±1.7 | 22.8±0.3 | 575 | 80 |
| 31 | 27.3±2.3 | 23.1±1.0 | 600 | 78 |
| 36 | 30.4±1.4 | 25.1±2.5 | 463 | 78 |
| 41 | 34.2±1.9 | 26.6±1.1 | 566 | 80 |
| 46 | 33.2±1.8 | 26.1±0.5 | 455 | 80 |

**Table S2.** Effects of stand age on the abundance and diversity of soil macrofauna of Metasequoia glyptostroboides plantations. He: herbivores, Ca: carnivores, De: detritivores, Om: omnivores. ($P$ < 0.001*** $P$ < 0.01 ** $P$ < 0.05 *).

| Variables | Treatment | F value | Functional Groups |
|---|---|---|---|
| Total abundancer | age | -0.344** | |
| Shannon-Wiener index | age | 0.778* | |
| Pielou uniformity index | age | 0.805* | |
| Armadillidae | age | -0.596** | De |
| Oniscidaea | age | -0.549** | De |
| Formicinae | age | -0.005 | Om |
| Myrmicinae | age | 0.113 | He |
| Carabidae | age | -0.184 * | Ca |
| Brentidae | age | -0.235** | Om |
| Staphylinidae | age | -0.213 * | Ca |
| Scarabaeidae | age | 0.077 | He |
| Cicindelidae | age | 0.101 | Ca |
| Scolopendridae | age | -0.097 | Ca |
| Geophilidae | age | 0.076 | Ca |
| Cryptodesmidae | age | -0.110 | De |
| Paradoxosomatidae | age | -0.073 | De |
| Cydnidae | age | -0.230 ** | He |
| Enicocephalidae | age | 0.130 | Ca |
| Lumbricidae | age | -0.002 | De |
| Diplatyidae | age | -0.097 | Om |
| Opiliones | age | -0.046 | Ca |
| Grylloidea | age | -0.279 ** | He |
| Eumastacoidea | age | -0.127 | He |
| Araneae | age | -0.013 | Ca |
| Psocidae | age | -0.018 | He |
| Scutigeridae | age | -0.051 | Ca |
| Saturniidae | age | 0.112 | He |
| Geometridae | age | 0.026 | He |

**Table S3.** Properties of soil and litter during plantation succession. Data are presented as means of the replicates ± standard error; different letters indicate statistically significant differences between treatments based on the Tukey-HSD test ($P < 0.05$). Soil organic carbon (SOC), total nitrogen (TN), nitrate nitrogen ($NO_3^-$), ammonium nitrogen ($NH_4^+$), microbial biomass carbon (MBC), microbial biomass nitrogen (MBN), soil water content (SWC), soil temperature (ST), litter temperature (LT), litter biomass (LB), litter total carbon (LC), litter total nitrogen (LN).

| | **Stand age (year)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Properties** | 7 | 16 | 21 | 26 | 31 | 36 | 41 | 46 |
| MBN (mg $kg^{-1}$) | 171.42±11.71bc | 182.78±11.4bc | 145.79±7.98c | 226.23±14.26a | 226.79±15.51a | 163.97±14.74bc | 197.21±9.88ab | 204.92±18.75ab |
| MBC (mg $kg^{-1}$) | 476.00±29.5bc | 619.40±56.75ab | 446.5±47.25c | 630.51±66.57ab | 630.71±74.4ab | 495.67±41.39abc | 607.02±47.63abc | 656.81±60.15a |
| TN (g $kg^{-1}$) | 0.89±0.06b | 1.17±0.03ab | 1.17±0.12ab | 1.24±0.05s | 1.22±0.07sb | 1.27±0.09s | 1.18±0.03sb | 1.21±0.11sb |
| $NH_4^+$ (mg $kg^{-1}$) | 1.82±0.34a | 1.19±0.24a | 0.88±0.26a | 3.82±2.32a | 1.33±0.43a | 0.97±0.19a | 2.06±0.48a | 1.97±0.6a |
| $NO_3^-$ (mg $kg^{-1}$) | 12.23±1.98a | 15.56±2.68a | 15.83±2.6a | 13.03±1.8a | 16.17±3.23a | 13.17±1.76a | 15.30±2.8a | 10.87±1.57a |
| SOC (g $kg^{-1}$) | 10.73±0.84c | 12.33±1.00bc | 13.44±0.62abc | 13.16±0.82abc | 15.57±1.97ab | 16.76±0.95ab | 15.79±1.33ab | 17.04±2.53a |
| LB (g $kg^{-1}$) | 171.39±9.79a | 153.9±12.15abc | 145.13±12.08abc | 155.13±18.81abc | 123.37±8.45c | 161.9±10.44ab | 137.87±6.22abc | 128.33±8.47bc |
| LN (g $kg^{-1}$) | 205.22±48.67a | 212.95±50.34a | 209.83±49.32a | 192.02±45.77a | 198.42±47.83a | 198.9±47.24a | 189.93±45.68a | 208.63±49.52a |
| LC (g $kg^{-1}$) | 194.18±45.43a | 206.34±50.24a | 228.24±61.44a | 197.2±47.73a | 210.28±50.44a | 200.48±47.97a | 198.3±47.11a | 171.87±40.9a |
| LT (℃) | 16.85±1.93a | 17.25±1.98a | 17.2±1.93a | 16.57±2.01a | 16.01±1.81a | 16.1±1.68a | 16.77±1.83a | 16.05±1.8a |
| ST (℃) | 16.38±1.75a | 16.65±1.75a | 16.68±1.73a | 16.42±1.8a | 16.09±1.66a | 16.12±1.64a | 16.52±1.68a | 16.47±1.6a |
| SWC (%) | 24.06±1.02d | 25.78±1.42dc | 28.24±1.02c | 31.91±1.09b | 32.36±1.08b | 33.11±1.06b | 37.49±0.61a | 39.48±0.69a |