**Figure S1.** Forest ground layer in the coniferous forest (left) and the broadleaf forest (right). (Moss inside the white circle was excluded to better present the litter of the coniferous forest)
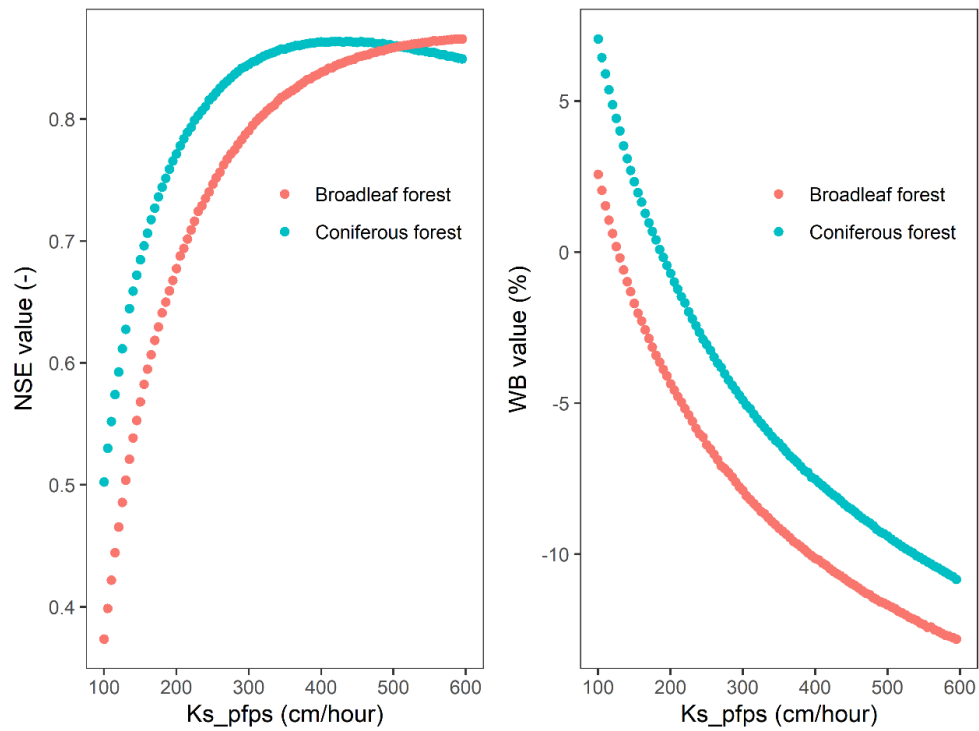
**Figure S2.** Sensitivity analysis of saturated hydraulic conductivity of PFPs (Ks_pfps) to NSE and WB at event scale.
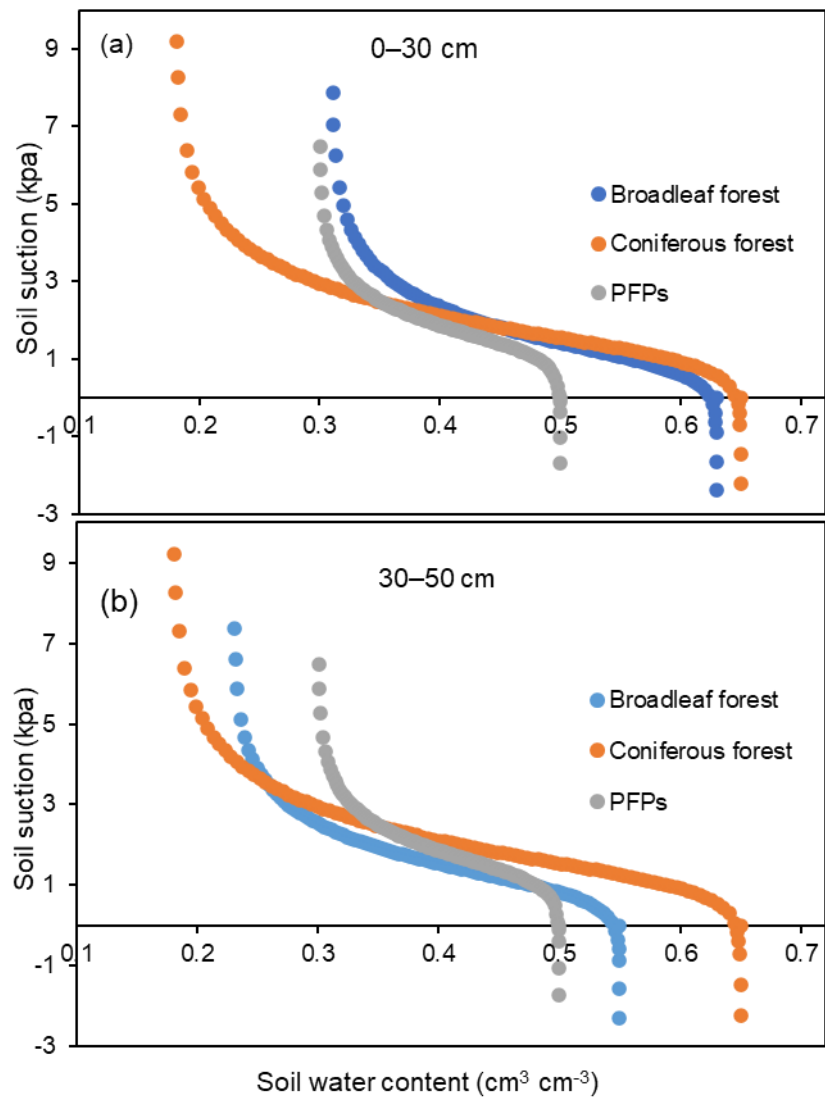
**Figure S3.** Water retention curve of the soil and the PFPs in different depths and forest types.

Table S1. Time and corresponding volume of peak flow in sequence at event scale.

| Set-ups | Coniferous forest | | | | | | Broadleaf forest | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st peak time (hr) | 2nd peak time (hr) | 3rd peak time (hr) | 1st peak amount (cm$^2$ hr$^{-1}$) | 2nd peak amount (cm$^2$ hr$^{-1}$) | 3rd peak amount (cm$^2$ hr$^{-1}$) | 1st peak time (hr) | 2nd peak time (hr) | 3rd peak time (hr) | 1st peak amount (cm$^2$ hr$^{-1}$) | 2nd peak amount (cm$^2$ hr$^{-1}$) | 3rd peak amount (cm$^2$ hr$^{-1}$) |
| LV-LbL | 14.11 | 32.99 | 61.72 | 9.30 | 46.37 | 44.90 | 13.15 | 32.51 | 61.31 | 11.00 | 54.59 | 47.70 |
| LV-LL | 13.62 | 32.81 | 61.23 | 11.50 | 48.16 | 44.94 | 13.23 | 32.44 | 61.23 | 13.81 | 55.20 | 47.03 |
| LV-ML | 14.62 | 33.26 | 62.19 | 12.95 | 52.50 | 44.39 | 13.74 | 33.75 | 62.21 | 15.10 | 61.37 | 47.03 |
| Mean | **14.12** | **33.02** | **61.71** | **11.25** | **49.01** | **44.74** | **13.37** | **32.9** | **61.58** | **13.30** | **57.05** | **47.25** |
| LV-LbL-G | 12.48 | 31.00 | 60.31 | 16.81 | 64.03 | 53.33 | - | - | - | - | - | - |
| LV-LL-G | 9.65 | 31.13 | 60.15 | 19.49 | 62.98 | 53.13 | 9.18 | 31.23 | 60.23 | 23.45 | 67.13 | 54.55 |
| LV-ML-G | 9.50 | 31.51 | 60.54 | 23.54 | 65.80 | 51.21 | 9.40 | 31.48 | 60.38 | 24.39 | 63.91 | 51.18 |
| Mean | **10.54** | **31.21** | **60.33** | **19.95** | **64.27** | **52.56** | **9.29** | **31.36** | **60.31** | **23.92** | **65.52** | **52.87** |