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# Biomass allocation pattern in the temperate meadow steppe of Northern China

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## Abstract

Grasslands are one of the most widespread landscapes worldwide, covering approximately one-fifth of the world's land surface. Although China's grasslands cover only 6–8% of the world's total grassland area, they store 9%–16% of the total carbon in the world's grasslands. Many studies have focused on monitoring and understanding the factors affecting carbon partitioning; however, the role of species composition in carbon partitioning is still not fully understood. In this study, we evaluated the biomass distribution patterns and other indexes of vegetation in the meadow steppe of northern China, based on geographic information system (GIS) tools and field data for different community types. The results showed that the average biomass carbon density was 566.35 g C/m<sup>2</sup> in the temperate meadow steppe. Among the different plant communities, *Sanguisorba officinalis* with 460.63 g C/m<sup>2</sup> had the highest aboveground biomass (AGB), while a tessellated meadow had the highest belowground biomass (BGB). However, there were no significant differences in BGB among other types of plant communities ( $P > 0.05$ ). The temperate meadow steppe contributed 111.20 Tg biomass carbon within an area of  $12.90 \times 10^6$  hm<sup>2</sup>, where the AGB was 27.57 Tg and the BGB was 83.63 Tg. The root: shoot in the temperate meadow steppe was 3.03. There were two types of BGB distribution: the exponential function type, in which the BGB was mainly distributed at soil depths of 0–10 cm and 20–40 cm. The BGB distribution was the exponential function type in the *Filifolium sibiricum*, *Achnatherum splendens*, *Hordeum agriocrithon*, *Sanguisorba officinalis*, *Stipa Baicalensis*, *Carex tristachya*, and the tessellated meadow communities, indicating that this type of BGB distribution was a characteristic of grassland communities. The *Calamagrostis epigeios*, *Caragana microphylla* and *Phragmites australis* communities showed a BGB distribution that fitted the quadratic function, rather than the exponential function. Evaluation of grassland biomass carbon storage by different grassland communities is meaningful for understanding carbon storage dynamics. The results of this study provide a theoretical basis for developing management strategies and designing research on natural grasslands in northern China.

**Keywords:** meadow steppe, carbon density, biomass, communities

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