Aboveground biomass and the spatial distribution pattern of herbaceous marsh vegetation

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Wetland, forest, and ocean are the three largest ecosystems in the world. Although the area of wetland ecosystem accounts for only 4-6% of the total land area, the carbon reserves of wetland ecosystem accounts for

12-24% of the global land carbon reserves. Under the background of global climate change, research on carbon sequestration of wetland has become an important subject of global carbon cycle research.

The area of marshes in China ranks third in the world, and herbaceous marsh is the most widely distributed among all the types of marshes. As an important quality parameter of marsh ecosystem, aboveground biomass of vegetation is a crucial index estimating the carbon storage of marsh vegetation, and the basis for studying the carbon sequestration of marshes. At present, many scholars have studied the local or regional vegetation biomass of herbaceous marsh in China, but the aboveground biomass of herbaceous marsh on a national scale is not clear.

With the support of the National Science & Technology Fundamental Resources Investigation Program of China "Comprehensive survey on the resources of wetlands and their main eco-environmental benefits in China", more than 100 scientific researchers from 12 institutions systematically investigated wetland resources in China. It surveyed the conditions of plant, water, and ecological benefits of 440 wetland patches in China, with a total of 18390 survey quadrats. Aboveground biomass of herbaceous marsh were measured to obtain the most extensive and comprehensive data of herbaceous marsh vegetation in China. This survey thoroughly investigated the situation of marsh wetland and provided an important basic dataset for the protection and scientific management of marsh wetland in China. "Based on the data obtained by this large-scale survey, this work analyzed the aboveground biomass and its spatial distribution pattern of herbaceous marsh vegetation in China", Jiang Ming said.

The results showed that the total area of herbaceous marsh in China is about 9.7×104 km^2, and the average aboveground biomass density of China's herbaceous marsh vegetation was about 227.5 g C m^{-2}. As a result, the total aboveground biomass of herbaceous marsh vegetation

was about 22.2 Tg C.

Spatially, the aboveground biomass density of herbaceous marsh in China ranges from 12 to 1400 g C m^{-2}, with low biomass in Northeast China and the Tibetan Plateau, but high biomass in central North China and coastal regions. The results showed that the order of biomass density of herbaceous marsh vegetation from small to large was temperate humid and semi-humid marsh region (182.3 g C m^{-2}) $^{-2}$) $^{-2}$) $^{-2}$) $^{-2}$). Although the average biomass density of herbaceous marsh vegetation in the temperate humid and semi-humid marsh region is the lowest, the area of herbaceous marsh is the largest (5.3×104 km^2) among the five marsh distribution regions. Therefore, the total aboveground biomass of herbaceous marsh vegetation in this region is the largest. Similarly, although the average aboveground biomass density of herbaceous marsh vegetation in the coastal marsh region is the largest, the herbaceous marsh area is the smallest (0.2×104 km^2) among the five marsh regions. Therefore, the total aboveground biomass of coastal herbaceous marsh vegetation is the smallest.

The biomass spatial distribution of herbaceous marsh vegetation has obvious non-zonality characteristics, but also shows a certain zonality law in some regions. In subtropical humid marsh and coastal marsh regions, the aboveground biomass of vegetation has no obvious correlation with hydrothermal conditions and altitude. This may be because the subtropical humid marsh region and the coastal marsh region have better hydrothermal conditions, which are suitable for vegetation growth, and hydrothermal conditions are not the limiting factor for marsh vegetation growth. The non-zonality characteristics of herbaceous marsh plants in these regions are more obvious.

In the Tibetan Plateau, the biomass of herbaceous marsh decreases with the increasing elevation. With the increase of altitude, the temperature decreases, and the environment worsens. Thus, the ability of plants to

obtain the maximum photosynthetic energy declines, resulting in a low aboveground biomass in high altitude region.

In temperate arid and semi-arid regions and temperate humid and semi-humid regions, the aboveground biomass of herbaceous marsh vegetation first decreased and then did not change obviously with the aggravation of drought. This may be because that the availability of soil water in temperate region decreases with the aggravation of drought.

In the temperate humid and semi-humid region, the aboveground biomass of herbaceous marsh vegetation is relatively larger in warmer regions. The main reason for the low aboveground biomass density of vegetation in cold region may be that the poor climate and other environmental conditions in these regions lead to short herbaceous plants with low coverage.

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