

城市绿心生态系统多功能性及驱动因素研究

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摘要: 【目的】城市的快速发展在改善人们生活质量、促进社会经济发展的同时, 也给人类福祉和城市可持续性带来了诸多挑战。城市绿心作为城市快速发展的缓冲区, 能提供多种生态系统服务, 减缓城市挑战。但是, 如何科学评价城市绿心的生态系统服务及其调控机制是目前城市生态学的难点和热点问题。【方法】该研究利用野外森林资源样地调查数据, 选择城市挑战的 8 个重要指标, 对我国最大的城市绿心——长株潭绿心区进行生态系统服务多功能性评价, 识别了多功能性热点区及其调控因子。【结果】结果表明, 多功能热点区主要分布在山地森林区域, 地带性植被常绿阔叶林能够促进生态系统服务的提升。其中, 常绿阔叶林对固碳、城市热岛效应缓解和洪峰缓解的贡献最大, 针叶林对 PM_{2.5} 清除的贡献最大。【结论】山地景观和树种多样性是城市绿心生态系统服务多功能性的关键调控因子。在南方山丘区城市的发展应重点保护自然的山地景观和增加树种多样性, 有利于提高城市生态系统服务的多功能性以及人类福祉。

关键词: 城市生态系统; 多功能性; 森林异质性; 生物多样性

Assessment of urban multifunctionality and its driving factors in urban green heart area

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Abstract: 【Objective】 Rapid urbanization has improved the socioeconomic conditions of people's lives but caused multiple environmental challenges that degrade human well-being and impair urban sustainability. Urban green heart area, an ecological multi-functional space preventing rapidly spreading urbanization, can mitigate challenges through providing key ecosystem services. However, there is still insufficient knowledge of its contribution to sustainable management of multifunctionality in crucial ecosystem services that are closely linked to the living quality of urban dwellers. 【Method】 Here, we quantified eight ecosystem services and multifunctionality of a large green heart area located at the center of the Changsha-Zhuzhou-Xiangtan urban agglomeration in subtropical China, based on the field inventory data of vegetation and clarify the main factors that affect ecosystem services and multifunctionality. 【Result】 Forests made substantial contributions to multifunctionality by promoting most ecosystem services, especially evergreen broadleaved forests. Broadleaved forests contributed significantly to net primary production (NPP), urban heat island effect mitigation, and runoff reduction. Coniferous forests promoted the particulate matter (PM_{2.5}) removal rate to reduce air pollution. 【Conclusion】 Biodiversity and mountainous landscapes were the main factors promoting multifunctionality, thus conserving natural broadleaved forests in mountainous areas and converting planted pure forests in flat areas to mixed conifer-broadleaf forests could improve the urban ecosystem multifunctionality and resilience.

Key words: urban ecosystem services; multifunctionality; forest heterogeneity; biodiversity.