

南京市银杏行道树生态系统服务评价

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摘要:【目的】随着城市森林建设实践和研究在世界各国的开展,我国城市森林建设也成为林业研究的热点,其中行道树是城市化发展较高地区的城市森林主要绿化主体,分析行道树对社区生态的影响可以指导相关建设实践。【方法】本研究以南京市主城区银杏行道树为研究对象,根据城区绕城道路划分三个环形研究区,运用 i-Tree Streets 模块计算出所有银杏行道树的生态效益价值,并借助地理探测器中的因子探测器方法,从空间尺度深入研究三个环形区生态效益与城市地理因子的耦合关系,并说明不同驱动因子对于银杏行道树生态效益的解释程度。【结果】(1) 研究区银杏行道树的美学效益总价值(\$782,218/年)在本次研究涉及到的五类效益中所占比例最高,达 76.83%,对研究区生态效益贡献第二大的是截留雨水效益,占总效益的 10.39%,其余三个生态效益对总效益的贡献不足 10%,节能效益、吸收固定 CO₂ 效益和改善空气质量效益分别占总效益的 9.01%、2.15%和 1.62%;(2) 不同分环的单株银杏行道树年总效益为一环 60.05\$/株,二环 67.50\$/株,三环 58.97\$/株,二环的单株银杏生态效益值高出总平均值 8.47%,一环和三环的值分别低于平均值 3.50%和 5.24%;(3) 研究区银杏行道树生态效益格局具有明显的空间异质性,存在明显的高值区和低值区,一环出现热点区域,其中 90%以上集中在南部区域,二环东部区域出现一个冷点,土壤类型、与水体的距离和道路宽度是影响树木生态效益的重要驱动因素。【结论】通过对南京市银杏行道树生态效益价值及相应地理驱动因子的相关分析,本研究对南京市银杏行道树的规划管理进行了综合评价,为城市森林更新、银杏行道树栽培与种植、城市行道树的养护管理、城市道路规划设计、城市居住用地与绿地面积的协调分布提供科学依据。

关键词: i-Tree 模型; 银杏行道树; 驱动因子; 生态效益评价

Evaluation of ecosystem services of *Ginkgo biloba* street trees in Nanjing

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Abstract: 【Objective】 With the urban forest construction practice and research in countries around the world, China's urban forest construction has also become a hotspot for forestry research, in which street trees are the main greening body of urban forests in areas with high urbanization development, and the analysis of the impact of street trees on the community's ecology can guide the relevant construction practice. 【Methods】 *Ginkgo biloba* roadside trees in the main urban area of Nanjing were the research object of this study. Three circular study areas based on urban bypass roads. The i-Tree Streets module was used to calculate the ecological benefits value of all the *Ginkgo biloba* roadside trees. The factor detector method in geographic detectors was used to deeply study the coupling relationship between three ring divisions ecological benefits and urban geographical factors at the spatial

scale, and the explanatory degree of different driving factors on the ecological benefits of *Ginkgo biloba* roadside trees was explained. **【Results】** (1) The aesthetic whole value of *Ginkgo biloba* roadside trees in the study area (\$782,218/year) accounted for the highest proportion of the five types of benefits involved in this study, reaching 76.83%. The second largest contribution to the ecological benefits of the study area was the interception of rainwater, accounting for 10.39% of the total benefits. The other three ecological benefits contributed less than 10% to the total benefits. Energy saving benefits, CO₂ sequestration benefit, and air quality improvement benefits accounted for 9.01%, 2.15%, and 1.62% of the total benefits, respectively; (2) The annual average benefits of individual *Ginkgo biloba* roadside trees with different ring divisions were 60.05 \$/plant for the first ring, 67.50 \$/plant for the second ring and 58.97 \$/plant for the third ring, respectively. The ecological benefit value of a single *Ginkgo biloba* in the Second Ring was 8.47% higher than the total average value. The values of the First Ring and Third Ring were 3.50% and 5.24% higher than the average value, respectively. (3) The eco-efficiency pattern of *Ginkgo biloba* street trees in the study area has obvious spatial heterogeneity, and there are obvious high-value and low-value zones. The First Ring was observed as a hot spot in the study, with over 90% concentrated in the southern region, and a cold spot appeared in the eastern region of the second ring. Soil type, distance to water bodies, and road width emerged as significant driving factors affecting the trees' ecological benefits. **【Conclusion】** Through the analysis of the ecological benefits and corresponding geographical driving factors of *Ginkgo biloba* roadside trees in Nanjing, this study conducted a comprehensive evaluation of the planning and management of *Ginkgo biloba* roadside trees in Nanjing, And provided scientific basis for urban forest renewal, cultivation and planting of *Ginkgo biloba* roadside trees, maintenance and management of urban roadside trees, urban road planning and design, and coordinated distribution of urban residential land and green space area.

Keywords: i-Tree model, *Ginkgo biloba*, driving factors, ecological benefit evaluation