

# 基于眼动追踪的杉木人工林景观质量研究

(熊熠轲、钟永德、中南林业科技大学)

**摘要:**【目的】杉木是我国南方(秦岭以南)特有的用材树种,是我国最重要的乡土针叶用材树种。第九次全国森林资源清查表明,杉木人工林面积达到1.48亿亩,蓄积量达7.55亿 $m^3$ ,分占全国人工乔木林总面积、总蓄积量的1/4和1/3,均排名第1,杉木人工林景观是我国南方(秦岭以南)森林景观的主要组成部分。目前关于杉木人工林的研究主要集中于杉木遗传育种、森林培育、计测等方向,从森林旅游的角度看,杉木人工林景观作为南方森林景观的主体部分,对南方森林旅游的发展具有重要影响,但目前关于杉木人工林景观与旅游相结合的相关研究较少。故此次借助眼动追踪技术对于杉木人工林的景观质量进行研究。【方法】本文在对国内外森林景观质量相关概念和研究、眼动追踪应用研究进展、森林景观质量研究情况进行梳理、综述的基础上,采用眼动追踪的视觉科学技术,借助Tobii Pro Glasses 2可穿戴式眼动仪,以我国杉木中心产区湖南会同杉木林生态系统国家野外科学观测研究站的34块杉木人工林为实验样地,以湖南省中南林业科技大学在校生为实验对象,以学生专业为林学或非林学为实验控制变量,使其自由观看杉木人工林景观的图片,以此获取相关的数据,利用SPSSPRO分析人们对树种及其器官特征的偏好。【结论】(1)对比八个不同龄级,人们更加喜欢龄级更高的杉木人工林,而对于同一龄级不同样地的杉木林景观,人们的喜好程度没有区别;对比三种不同视角的杉木人工林景观,人们最喜爱的是 $45^\circ$ 倾斜摄影得到的林冠照片,其次是林内165cm眼高拍摄的林内景观,对于林冠层上方 $90^\circ$ 垂直俯视的景观人们的兴趣不高;对比林学与非林学的学生,对于景观的关注点并无很大差异。(2)通过SBE法结果得出,各龄级不同指标之间趋势大致相同,人们普遍杉木人工林景观的色彩丰富度、种类丰富度、构成元素丰富度三类指标数值较低;杉木林龄级越高,其景观层次丰富度、空间开敞度与吸引程度会提升;景观的特色鲜明度、视觉占有率、景观和谐度数值较为稳定,受杉木林龄级影响的程度不大。(3)通过分析调查问卷结果得出,认为杉木人工林景观质量很高的占12.6%、较高的占55.5%、一般的占28.8%、较低的占3.1%。总体来看,认为杉木人工林景观质量较高及以上的占68.1%,杉木人工林的景观是具有一定的开发价值的。

**关键词:**眼动追踪;杉木人工林;森林景观质量;

## Abstract

**【Objective】** Fir is a unique timber species in southern China (south of Qinling) and the most important native coniferous timber species in China. The ninth national forest resources inventory shows that the area of fir plantation forest reached 148 million mu, the stock reached 755 million  $m^3$ , accounting for 1/4 and 1/3 of the total area and total stock of artificial arbor forest in the country, both ranked first, fir plantation landscape is the main component of the forest landscape in southern China (south of Qinling). From the perspective of forest tourism, fir plantation landscape as the main part of southern forest landscape, has an important impact on the development of southern forest tourism, but there are few related studies on the combination of fir plantation landscape and tourism. Therefore, this time, eye tracking technology was used to study the landscape quality of fir plantations. **【Methods】** Based on the combing and review of the concepts and research related to forest landscape quality at home and abroad, the research progress of eye tracking application, and the research situation of forest landscape quality, this paper uses the visual science technology of eye tracking, with the help of Tobii Pro Glasses 2 wearable eye tracker, 34 fir plantations in Hunan Hunan, the central production area of China, and the National Field Scientific Observation and Research Station of Fir Forest Ecosystem, are used as experimental plots, and students of Central South University of Forestry and Technology in Hunan Province are taken as experimental subjects. Taking forestry or non-forestry as the experimental control variable, students were allowed to freely view pictures of the landscape of fir plantations, so as to obtain relevant data, and SPSSPRO was used to analyze people's preferences for tree

species and their organ characteristics. **【Conclusion】** (1) Compared with the eight different age levels, people prefer fir plantations of higher ages, while there is no difference in people's preference for fir forest landscapes of different age levels. Compared with the landscape of fir plantation from three different perspectives, people's favorite is the canopy photo obtained by 45° oblique photography, followed by the forest landscape taken at 165cm eye height in the forest, and people are not interested in the landscape with a vertical view of 90° above the canopy. Compared to forestry and non-forestry students, there is not much difference in the focus on landscape. (2) The results of SBE method show that the trend is roughly the same between different indicators of different age levels, and the values of three types of indicators of color richness, species richness and constituent element richness of fir plantation landscape are generally low. The higher the age level of the cedar forest, the richness of the landscape level, the openness of the space and the degree of attraction will increase. The values of the characteristic distinctness, visual occupancy rate and landscape harmony of the landscape are relatively stable, and the degree of influence of the age level of the fir forest is not large. (3) Through the analysis of the questionnaire results, 12.6% of the fir plantations were considered to have high landscape quality, 55.5% high, 28.8% general and 3.1% low. Overall, 68.1% believed that the landscape quality of fir plantations was high or above, and the landscape of fir plantations had certain development value.