

Studies on Ecological Structure of Plant Communities in Urban Garden & Optimize and Design on Landscape

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Keywords: Garden Plants; Ecological Structure; Landscape Design

Abstract: Plant community is the basic unit of urban green space and the basis of the ecological function of urban green space system. Based on this, the paper analyzes the ecological structure research and landscape optimization of urban garden plant communities, selects the typical plant communities that are relatively stable in the main parks of Changsha City, discusses the ecological structure characteristics of garden plants, and proposes the landscape optimization design method. The article research provides reference for the optimization design of urban garden landscape.

1. Introduction

Park green space is an important part of urban green space, and plant community is the basic unit of urban park green space [1]. Its structural characteristics determine the quality of park green space plant landscape and the function of ecological function. Constructing a scientific and rational plant community can make the green land landscape quality efficient, stable and healthy development, and play an important role in the process of protecting and beautifying the environment, enhancing the park landscape effect, and maintaining the urban ecological balance [2]. The urban green space community is particularly strongly interfered by humans. Most of the green plants are artificially planted. The types of green land are diverse but the scale is small [3]. The composition, structure, function and dynamics of the green space community are significantly different from the natural plant communities and agricultural and forestry plant communities. Reports on green plant communities have focused on the cataloguing of urban greening plant species, green land community types, species richness, etc, and reports on the analysis of green space community structure by plot method are rare in China.

2. Plant Community and Plant Landscape Related Concepts

In nature, any plant species is not a separate life, and there are always many other species of plants living together [4]. A plant community is a population of certain plants that is formed under certain habitat conditions [5]. Within a plant population, plants and plants, plants and the environment have a certain relationship, and form a unique internal environment or plant environment. Vegetation communities can be divided into natural communities and artificial communities according to their formation [6]. Natural communities are naturally formed communities under different climatic conditions and habitat conditions during long-term historical development. Each natural community has its own unique species, appearance, hierarchy and structure. Artificial communities are formed by planting plants of the same species or different species according to human needs, and are subject to the needs of people to produce, watch, and improve environmental conditions [7]. Apart from partially fragmented natural reserves, urban plant communities are mostly typical artificial communities, often given different functions from natural communities, and are selected, configured, constructed and maintained in accordance with people's wishes [8]. Therefore, under the artificial selection and control of the plant landscape of urban park green space, the proportion of exotic ornamental vegetation is improved, the community level is relatively clear, the structure is single, and the garden appearance and pattern are obvious.

There are many concepts related to "plant landscape", such as "plant landscaping" and "plant configuration". The plant landscape mainly refers to the image expressed by natural vegetation,

plant community and individual plants, which is transmitted to the cerebral cortex through people's senses, and produces a kind of real beauty feeling and association [9]. The plant landscape also includes artificial, that is, landscapes created using plant themes. Plant landscaping refers to the application of trees, shrubs, herbs and vines to create landscapes, giving full play to the natural beauty of the plants themselves, lines, colors, etc., and planting them into a beautiful and moving picture for people to watch. The plant landscape defined in this paper is in the urban area, with garden plants and other materials such as trees, shrubs, herbs, and vines as the main body, following a certain aesthetic principle and ecological principles, artificially constructed and carrying multiple functions. Plant landscape. Garden plants are the only natural elements in garden plant landscaping [10]. Plants change their color, texture, density and other characteristics with the seasons, creating different landscapes, and any elements in the garden can not be replaced. Landscaping and "ecology" dual functions. The landscape of garden plants is artificial landscape, with regular spatial layout, remarkable economy and high energy efficiency, highly specialized functions and huge transformation efficiency, and the common features of artificial landscapes such as the visual diversity of landscapes. This is very different from natural plant communities. The plant landscape is a visual landscape that can be evaluated using visual landscape evaluation methods.

3. Research Objects and Methods

3.1. Research object

Changsha City is a subtropical monsoon humid climate zone with mild and humid climate, obvious seasonal changes, cold winters and hot summers. The annual average temperature is 17.2 °C. The parent material in the territory is mainly Quaternary red clay. The zonal soil in the area is red soil. The main soil types are red soil, yellow soil and yellow brown soil, and red soil is the most widely distributed. Changsha City belongs to the central subtropical evergreen broad-leaved forest area. It has rich and colorful ornamental plant resources. According to statistics, there are 613 kinds of ornamental plants, including 196 species of woody plants, 108 species of trees, 88 species of shrubs, and other flowers and herbs. Kind. Due to the frequent human activities, the native vegetation has been basically developed. Now the vegetation is mainly masson pine forest, Chinese fir forest, bamboo forest and Camellia forest.

Changsha City currently has park green areas, including 7 comprehensive parks, 11 community parks, 4 special parks, 5 strip parks, and 10 green spots on a certain scale. The park has a green area of 1,377 square meters. In the analysis of the article, the provincial forest park is taken as an example. The provincial forest botanical garden occupies an important position in the hearts of the citizens because of its nature, geographical location and floor space. It represents the typical image of the development of Changsha city park green space in Changsha. City parks play a vital role in the construction of green spaces.

3.2. Research method

A community-based sample survey method was used. According to the functional division of the park green space, it is generally determined during the planning and design of the park, and the community plots to be investigated are selected in each functional area. According to the number of samples required, a representative community concentrated in a piece of each functional area was selected, and a plot of 10 m × 10 m was set up, and all plants in the plot were regarded as a community for research. A total of 32 garden planting plots were selected in the park, which were divided into three landscape areas: Sanxiangjing Park, Ornamental Plant Area, and Forest Sports and Recreation Area.

In the above-mentioned community sample, the hierarchical structure of the community was divided according to the different life forms of the plants, and each tree was surveyed in layers. In this study, the park plant community was divided into the arbor layer, the shrub layer of the woody individuals and the ground layer height of the wood native plants and the interlayer plant vines were statistically investigated.

3.3. Plant community ecological structure

There are 288 species of vascular plants belonging to 203 genera of 89 families, including 6 species, 6 genera and 6 species of ferns, 5 families, 12 genera and 18 species of gymnosperms, and 225 species of 185 genera and 78 families of angiosperms, respectively. 45.18%, 12.26% of the species). There are many families with more plant species: Rosaceae (12 species in 12 genera), Polygonaceae (14 species in 6 genera), Gramineae (13 species in 13 genera), Liliaceae (12 species in 8 genera), and legumes (6) There are 10 species), Maple family (1 genera and 10 species), Fagaceae (4 genera and 9 species), Cypress (4 genera and 8 species), Compositae (7 genera and 8 species). There are five families or more families, including Lonicerae (4 genera and 7 species), Polygonaceae (3 genera and 7 species), Pinaceae (4 genera and 6 species), Oleaceae (4 genera and 6 species), and Polygonaceae (4 genera). 6 species), Camellia (3 genera 6), Rubiaceae (5 genera and 6 species), Euphorbiaceae (5 genera and 6 species), Ranunculaceae (4 genera and 5 species), Magnoliaceae (2 genera and 5 species).

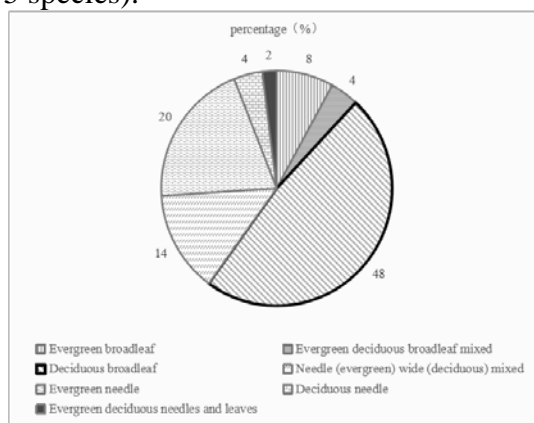


Fig.1. Community type

Vegetation components clearly reflect the transitional characteristics, and there are more plants in North China. Its typical zonal vegetation type is a mixed forest of deciduous tree species of the family Fagaceae, and contains a small number of evergreen broad-leaved trees, which is close to the deciduous broad-leaved forest. According to the important values of the dominant group (deciduous conifer, evergreen conifer, deciduous broad-leaved tree, evergreen broad-leaved tree) and the traits of the established species, the park plot community can be divided into the following seven types: deciduous broadleaf 24, accounting for 48% (13 of which have an evergreen component in the arbor layer, accounting for 54.2% of the deciduous broad-leaved type); 10 of the evergreen coniferous type, accounting for 20%; the needle (evergreen) is broad (deciduous) 7 mixed types, accounting for 14%; 4 evergreen broad-leaved types, accounting for 8%; 2 mixed evergreen deciduous broad-leaved leaves, accounting for 4%; 2 deciduous needles, accounting for 4%; evergreen leaves One coniferous mixed type, accounting for 2%. Figure 1 is a community type map. The urban park green space community has certain zonal characteristics, but the transitional vegetation type deciduous broad-leaved forest (the tree layer contains no evergreen component in the type of 45.8%) accounts for the construction of park green space community. Advantages, types with less zonal characteristics such as evergreen broad-leaved forests appear less frequently, but they still occupy a certain proportion.

The vertical structure of plant communities can be generally divided into arbor layer, shrub layer and ground layer and herb layer, but with the difference of plant community types, the development of each level is also different. The garden plant community is not only rich in species and dominant species, but also because the internal environment of the community formed by the group has improved the habitat of the middle and lower plants to some extent. Therefore, the small trees and shrub layers under the forest are rich in variety. There are 116 kinds. The most frequent occurrences are osmanthus and palm, which are 11 times, which is 22%. Followed by Haitong, it appeared 20 times for 20%. Among them, 61 species appeared only once in the plot, accounting for 52.59% of the total number of shrub species present in the plot, more than half. It indicates that although the

shrub layer species are abundant, most species are still not widely used, and the frequency of application is still concentrated in a few species. At the same time, the analysis of the renewed tree species in the understory shrub layer shows that the highest frequency of renewed tree species in the arbor layer is: eucalyptus, hackberry, and triangle maple.

3.4. Landscape evaluation and optimization

Urban garden modelling, greening horticultural technology and engineering technology are highly valued and over-amplified. Under the guise of “ecology”, deliberate pursuit of beautification effect, engineering convenience and profit priority, greedy and simple, plant cultivation is getting denser. The diameter of trees is getting bigger and bigger, the artificial carving is getting thinner and thinner, the effect of “physics” is chased one-sided, and the ecological process is neglected. At the same time, the community has intense interspecific and intraspecific competition, excessively pruned trees, the normal growth pattern of plants is inhibited or destroyed, the natural survival and development space of the population is restricted, the diversity and stability of the community are hindered, and the natural productivity is not. By excavation and development, the community is prone to degradation, green space pests and diseases are paralyzed, and subsequent adjustments and transformations come one after another, wasting manpower, material resources and financial resources.

In some parts of the city, especially parks, river banks, green belts, etc., properly restore or reconstruct some of the near-natural communities, create a good space for the city's new wildlife to forage, safety and reproduction, promote urban conservation, and meet the public's contacts. The need for natural wilderness and natural ecological education. Protect nature's wildness, provide a place where urban residents are close to nature, and protect the ecological environment with scientific and educational value.

The construction of near-natural communities should be based on the creation of multiple types of mixed habitats, using the heterogeneity of natural environment dominated by soil and water, simulating potential vegetation, adapting to the law of succession, and actively protecting naturally regenerated seedlings and young trees. Create environmental conditions for expanding space, such as proper thinning and creating gaps, improve the light and nutrient space of young seedlings, and optimize the regulation of community structure through management succession, avoiding the destruction of wild state by planting a small number of plants. At the same time, species that provide food for birds and other animals, such as honey plants and berry plants.



Fig.2. Plant configuration

For the park green space, according to the nature, function and landscaping requirements of different park green spaces and the characteristics and positioning of different scenic spots, rational selection of plant materials, on the basis of increasing the amount of green, using different planting forms and planting densities, forming diverse gardens. The space is lively and bright, and the four seasons have a view to meet the recreational and ecological functions. In the community configuration, in addition to the evergreen and deciduous key tree species, the main scenic area should use ornamental flowers and trees, as shown in Figure 2, plant a certain number of perennial flowers, enrich the community's lower layer diversity, and increase the community's ornamental.

4. Conclusion

The structural characteristics of the urban park green determine the quality of the plant landscape and the ecological function. In this study, we used plant community science and garden science to conduct a field survey of the relatively stable typical community in urban garden green space. Through a large number of reliable first-hand data, we systematically analyzed the floristic composition, community type and ecology of the community structure. The theoretical basis of urban green space construction is still relatively lacking, and the degree of artificial control is high. Some green land plant configurations do not conform to the internal laws of community structure and dynamic processes. Based on this, this paper proposes a variety of technical approaches to optimize community structure. The construction of urban park green space plant landscape is a fusion of community ecology, urban ecology and other multidisciplinary knowledge. The communities constructed according to different regions of the city and different environmental requirements have different types, functions, functions and structures. For different types of models, more types of construction methods and methods are needed to construct reasonable and stable plant communities according to local conditions.

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