

LETTER TO THE EDITOR

Landscape Design Art of Plant Community of Urban Forest Type Green Space

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With the rise of the local landscape construction movement, the plant landscape design which simulates the natural plant community gradually attracts people's attention. Taking Handan area of Hebei Province as an example, a systematic sampling method was used to investigate the forest vegetation in Handan Motianling. Based on the hierarchical structure and appearance characteristics of the 13 natural communities, and by applying the principles of garden art, plant landscaping and other related theories to simulate, a variety of plant landscape planting mode for the application of urban garden green space is constructed. This paper aims to provide a reference for the scientific construction of the plant community of shelterbelt, forest planting and patch planting in urban garden green space, and also provides a new solution for the green space landscape design in urban ecological garden construction.

Urban forests; Plant community; Landscape design; art

I INTRODUCTION

With the rise of the local landscape construction movement, the plant landscape design which simulates the natural plant community has gradually attracted people's attention. By studying and analyzing the basic types and hierarchical structure of the natural community in a certain region, the landscape of the natural community in this region can be used for reference, which is of great significance in improving the scientific and artistic planting of garden plants and reflecting the characteristics of the local plant landscape (Zhao et al 2018, Yang and Wang 2018). Stable plant community, less pests and diseases, can reduce the maintenance cost; Plants with multi-layer structure can effectively improve the ecological benefits of urban green space (Celik and Aciksoz 2017, Siraj et al. 2017). Many scholars have analyzed it and obtained some research results.

Zheng Xie published an article in Ekoloji Issue 107, 2019. The title is "Key Factors Influencing Landscape Design in Informatized Urban Development". As mentioned in this paper (Xie 2019), with the development of information and communication technology, many discourses begin to regard "the intelligence and ability of information technology" as another factor of urban competitiveness, which is also a basic skill necessary for modern people. Therefore, the rapid development of information and communication technology has changed the interaction between people, even the way we live and work has changed. Therefore, how to use the advantages of technological development to cope with the overall landscape planning and design of urban space, effective evaluation and development of appropriate strategies is the necessary condition for the overall development of the city. The purpose of this study is to survey the residents in Shandong Province. In this study, 500 questionnaires

were distributed and 382 valid ones were collected, with a recovery rate of 76%. Results: 1. In terms of secondary assessment, the most important aspect is “ecological principles”, and the second most important aspect is “consideration principle”, “application principle”, “economic principle” and “economic principle”. 2. Among the 15 evaluation indicators, the five most valued indicators are: reducing impact, improving environment, characteristics, environmental trend and supporting greening. On this basis, Suggestions are put forward to realize environmental planning and overall design through sound planning and improve the overall quality of sustainable development environment.

The community structure with local characteristics can show the local landscape from the perspective of vegetation. Faced with the rapid urbanization process, since the 1920s, some foreign biologists and landscape designers began to design the green space as the natural plant habitat and community. In the 1960s, German ecologist Tuxen put forward the theoretical key points of building ecological green land with zonal and potential plant species in accordance with the principle of “top community”. In the 1970s, the Japanese ecologist takashi miyagi created the miyagi afforestation method, which was based on the theory of potential natural vegetation and succession, and used local tree species to simulate the natural community structure and construct the local forest vegetation (Bi et al. 2018, Zhang et al. 2017). In the 1970s, the Japanese ecologist takashi miyagi created the miyagi afforestation method, which was based on the theory of potential natural vegetation and succession, and used local tree species to simulate the natural community structure and construct the local forest vegetation. In China, studies on simulating natural communities began in the 1980s. After entering the 21st century, with the trial implementation of the “palace threat afforestation method” in Shanghai, Beijing, Wuhan, Jilin, Shandong and other provinces and cities also began to simulate the construction of zonal plant communities in the construction of garden green space and forest vegetation restoration. Handan city is located at the southern end of Hebei Province, with the terrain descending from west to east in the shape of a ladder, with a great difference in elevation. The highest elevation is 1898.7 m, and the lowest is 32.7 m. Climate is a warm temperate continental monsoon climate, four seasons, the annual average temperature 13.5°C, annual average rainfall of 565.2 mm. The typical zonal vegetation type is deciduous broad-leaved forest in warm temperate zone. The motianling mountain in Handan was selected as the investigation site of natural vegetation, and there were large natural secondary forests in this area.

II IDEA DESCRIPTION

Motenlin township is located in Handan area north of Wuan Yang pride in southern Taihang Mountains, the geographical position is 36°59’N, 113°48’E, the northwest - southeast direction, the highest elevation of 747.5 m to 1, with a total area of 11 km². Which belongs to the warm temperate zone continental monsoon climate, four seasons, the annual average temperature 11.1°C, annual average rainfall of 653.3 mm, soil type is given priority to with brown soil, high altitude some mountain meadow soil. The vegetation is mainly deciduous broad-leaved forest with a few shrubs and shrubs (Shi and Xi 2018).

According to the field data, the relative important values of each plant in its lamina were calculated. The calculation method of relative importance value of tree layer and shrub layer is: relative importance value = (relative frequency + relative abundance + relative significance)/3. The calculation method of relative importance value of herb layer is: relative importance value = (relative frequency + relative abundance + relative coverage + relative height) /4.

According to the relative important values of tree layer and shrub layer plants in all communities, the community was divided by TWINSpan.

TWINSPAN grade classification was carried out for motianling sample quadrangles. Combined with the actual ecological significance of the surveyed area, the sample quadrangles with similar species were combined to form 13 groups, and the 13 groups were named as 13 flora groups (Fig. 1).

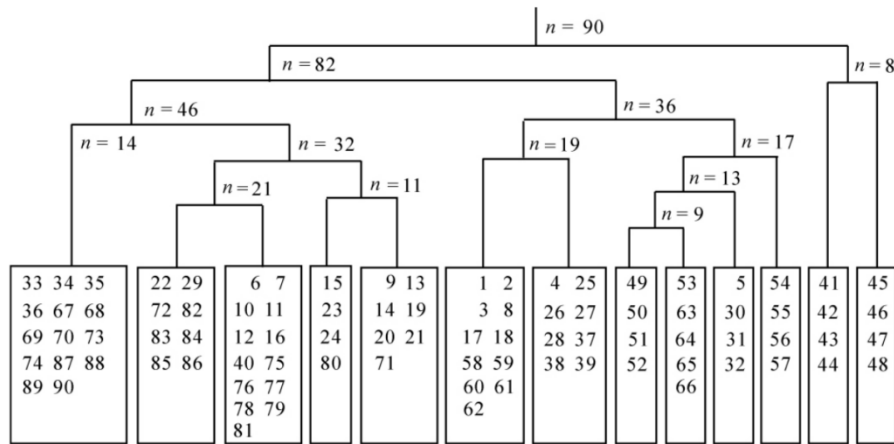


Fig. 1 TWINSpan classification diagram of 90 quadrangles in motianling forest community

In order to improve the level of urban biodiversity in Handan area, the natural communities of motianling can be used for reference in the construction of the plant landscape of shelter forest, forest planting and patch planting, and the targeted simulation of them can show the local plant landscape characteristics. In the simulation process, based on the ecological habits of plants and the premise of creating local style, the following methods are followed: (1) Nature. In line with the concept of following nature and learning from nature, the object simulated and used for reference by the plant landscape construction in Handan area is the natural plant community of Handan motianling. (2) Scientific. Plant landscape construction with Handan regional characteristics needs to be completed under the guidance of scientific concept. Its plant species are dominated by dominant and associated species in the natural community, and considering their adaptability in the city, similar species are selected for replacement when necessary. In the tree layer, the dominant species in the community were used to construct the basic skeleton, and the associated species were appropriately planted. Shrub layer, dominated by dominant species and associated species, refers to the hierarchical structure of the natural community, and concentrates the natural landscape in the form of a fragment of the natural community to create a rich mid-level plant landscape. Ground cover layer basically retains the dominant species of herbaceous layer in the original community, and at the same time, according to different landscape and functional requirements, plants corresponding companion species, occasional species or replacement species with similar ecological habits. (3) Artistic. Simulating natural community to create artificial plant landscape is not copying original community. It is necessary to extract and process the natural community by fully considering the plant color, volume, line collocation, season, canopy, forest margin and many other elements, so as to make it more artistic and practical under the premise of maintaining the original nature of the natural plant community. According to the above methods, 13 natural communities were simulated to form 13 artificial plant landscape planting patterns (Table 1).

Table 1 planting patterns and main characteristics of plant landscape

Based model	Main features
Mistle oak - mistle + mistle - mistle moss	Shelterbelt, autumn landscape
Live oak + Beijing clove, forsythia, grey Xun zhuang zi + soil meadow sweet - wrap around needle moss grass	Shelterbelt, spring, summer and autumn landscape

Hornbeam - forsythia + euonymus - carex	Water side with planting, spring, autumn landscape
Linden - small flower deutzia + big flower deutzia - bluegrass + bamboo	Landscape in spring and summer
Carpinus carpinus + Beijing lilac - florets deutzia + blackcurrant + blackcurrant (redwood) - larch	The four seasons landscape
Walnut rowan + Beijing lilac - forsythia + soil zhuang embroidery line chrysanthemum - needle moss grass	
Mountain peach + mountain apricot - forsythia - needle moss grass	Landscape in spring and summer
Hornbeam - Sam a brocade line chrysanthemum + six wood - needle moss grass	The spring landscape
Aspen + Beijing clove - forsythia + Sam brocade line chrysanthemum - needle moss grass	Landscape in spring, summer and autumn
Aspens + mistle quercus - forsythia + mistle mistle Daisy + mistle mistle - mistle moss	Road green space, spring, summer landscape
Hornbeam - hornbeam with many flowers and branches + elaeagnus japonicus + Sam brocade thread chrysanthemum - needle moss grass	Shelter forest, spring, autumn landscape
Mistle oak - rhizome + rhamnose - rhamnose	Landscape in spring and autumn
Rhizome - lichen	Shelter forest, spring landscape

Simulated “mistle” and “mistle quercus”, and formed the planting mode of “mistle quercus - mistle + mistle - mistle”, and built shelter forest and soil and water conservation forest system. In the upper space, mistle oak branches were opened to form a skeleton, and mistletoe and mistletoe were placed in the middle layer, and the lower layer was covered with lichens, which served as a basic model of fortification and recovery in high altitude areas. In addition, Wei MAO autumn leaf color becomes red, also can add seasonal photograph landscape.

Simulation “hornbeam + live oak forsythia + grey Xun zhuang zi + soil meadow sweet - wrap around needle carex” form “live oak + Beijing clove, forsythia + grey Xun zhuang zi + soil meadow sweet - wrap around needle carex” based model. In the upper space, mistletoe forms the skeleton, and Beijing cloves adorn it. Middle space, forsythia, grey Xun, soil meadow sweet zhuang, respectively, into a clump of planting, grey Xun, zhuang meadow sweet slightly shade-tolerance distribution under the forests, forsythia xi light plant side of the forests, the lower bottom to wrap around needle moss grass bed. Three layers of plant mutual collocation make spring, summer, can eat together (st John’s wort, soil meadow sweet zhuang, grey open clove Xun, Beijing time), autumn fruit a Xun (ash) can be three quarters of plant landscape. In addition, the plants selected in this model are barren resistant species, so they can be used as shelter forests in addition to general gardens and green Spaces.

The model of “hornbeam - forsythia - carex” was simulated to form the matching planting mode of “hornbeam - forsythia + euonymus - carex”. The upper layer is formed by hornbeam with beautiful branches and leaves. The middle layer of forsythia is planted in clusters at the edge of the forest, and the forsythia tuber is planted under the forest. Forsythia tuber flowers in early spring, pure flower phase, when in full bloom, a yellow flower, and the autumn leaves of forsythia tuber turn red, adding landscape and rich colors to the autumn. In addition to the general garden green space, this model can be applied to the water, spring and autumn season yellow forsythia, red David spear and blue water surface form a strong contrast.

The model of “linden - fleurage - deutzia” was simulated to form the model of “linden - fleurage - deutzia +

large-fleurage - deutzia - fleurage + amurensis”. The upper layer of linden forms a skeleton, and the middle layer plants floret deutzia and large floret deutzia in the forest, both of which have white and simple but luxuriant flowers, large floret deutzia in spring and small flower deutzia in early summer. The lower layer is covered with lichen grass, and bamboo is used as shade cover. In addition, the species used in this model are shade tolerant plants, which can be used in small environments with poor light conditions, such as the north side of buildings and artificial ravines, in addition to general gardens and green Spaces.

The model of “horns-fleur-deutzia” was simulated to form the matching pattern of “horns-fleur-deutzia in Beijing, currants in northeast China, and lardinia (redwood) -fleur-deutzia”. The upper layer forms a skeleton with hornbeam, and Beijing cloves adorn it. The middle shrub floret deutzia as the main body, and the northeast currant and sarin as the corresponding ornament, can also be replaced by redwood sarin, the lower layer to the moss grass floor, constitute the four seasons landscape. In spring and summer, the white flowers of shalin, deutzia and Beijing lilacs bloom for the first time. In autumn, the grossularis fruit is red, the hornbeam is peculiar. Winter, when 10 thousand wood wither, the branch gong yan that sha Lin comes or gong ruimu is marked.

The planting mode of “walnut rowan - forsythia - needle moss grass” is simulated to form “walnut rowan + Beijing lilac - forsythia + tuzhuang stiletto chrysanthemum - needle moss grass”, creating a plant landscape with flowers in spring (forsythia, tuzhuang stiletto chrysanthemum) and shade in summer (walnut rowan) and aroma (Beijing lilac). In the upper space, the crown of walnut and rowan develops, and the branches are large and shady, forming the main body. In the middle space, chrysanthemum with embroidery line of tuzhuang is planted under the forest and forsythia is planted at the edge of the forest. The branches of the two trees spread out and hang down to form a unity. The lower space is covered with moss.

The simulation of “mountain peach - forsythia - nordweed” forms the matching planting mode of “mountain peach + mountain apricot - forsythia - nordsia” to create the landscape of early spring plants. In the upper space, peach, apricot group plant, early spring first open, quietly elegant design and color; In intermediate space, cong plant becomes forsythia, the flower opens yellow, abound colour. This model is suitable for micro-topography, and can also be added to the upper space on the water side.

The model of “hornbeam - brocatum” and “hornbeam - brocatum - brocatum - brocatum” was simulated to form “hornbeam - brocatum - brocatum + six trees - brocatum”.The upper level is formed by hornbeam skeleton, the middle level three branches embroidery line chrysanthemum open spring, six wood from late spring to midautumn, flowers constantly, the three together to create spring, summer and autumn landscape.

Simulation of “aspen - forsythia - nordmann” (1) Aspen + Beijing clove - forsythia + Sam brocade line chrysanthemum - needle moss grass. In the upper space, poplar is used as the main body to form a sparse forest, and Beijing lilac is used as a sub-arbor layer to adorn it. On the one hand, the combination of the two can form a forest canopy with rich changes. In the middle space, chrysanthemum was planted under the forest, and forsythia was planted at the edge of the forest. The lichen understory. In addition, this model can also be applied to the road green space, where poplar and Beijing clove are planted on both sides of the road, and under them are chrysanthemum and forsythia. (2) Aspens + mistle quercus - forsythia + mistle line chrysanthemum + turgeon line chrysanthemum + mistle moss. Based on aspen and mistle oak as the upper layer, forsythia, mistle and mistle as the middle layer, and lichen as the lower layer, a multi-layer system of windshield was constructed.

Simulation “hornbeam - spend lespedeza - wrap around needle carex” form “hornbeam - spend lespedeza + crashing qiu hu child + three fork meadow sweet - wrap around needle carex” based mode, select hornbeam form the upper frame, clump planting more flowers lespedeza as the main body in the middle, three fork meadow sweet crashing, qiu hu adorned among them, the lower bottom to wrap around needle moss grass bed. In this model,

spring flowers (multi-flower hu zhi zi, chrysanthemum Dillon embroidery line) and autumn fruits (autumn elaeagnus elaeagnus) can be appreciated, with obvious seasonal changes.

Simulation of the planting mode of “mistle-quercus - rhizome - rhizome”, which forms “mistle-quercus - rhizome + rhizome - rhizome”. Mistle oak was taken as the upper layer, rhamnosus viscissus and viscissus viscissus were taken as the middle layer, and viscissus viscissus was taken as the lower layer.

It simulated the planting pattern of “herba huezhi-nordwort” to form “herba huezhi-nordwort”. This model is mainly applied to the early restoration of barren mountains with thin soil layer, and can be used for the site conditions such as barren mining land and barren mountains. This model plays the role of pioneer community and soil and water conservation.

III CONCLUSION

In this study, systematic sampling method and TWINSpan were used to investigate and analyze the forest vegetation in Handan motianling. By analyzing the hierarchical structure and external characteristics of each cluster, the dominant species and associated species in the cluster were selected to construct the skeleton, and the natural cluster was simulated. Finally, 13 plant landscape planting modes with local characteristics were formed. At present, the problem of single plant species, simple structure and monotonous landscape is common in the shelter forest land and urban green land planted by forest planting, strip planting and other methods in most Chinese cities. Most of the planting structure is dominated by single-layer trees, with occasional qiao-grass structure, and the vertical structure generally lacks layers. The planting form usually adopts the nursery planting with a certain plant spacing, which leads to the monotony and lack of change of forest canopy and forest margin. In shelterbelts, populus and salix are usually planted alone, lacking of seasonal change and landscape effect. The plant landscape design based on the simulation of natural community provides a new way to solve the above problems and to construct urban ecological gardens. On the one hand, according to the combination rules and structural characteristics of the local ecological environment and natural plant communities, the plant planting pattern can make full use of spatial resources and give full play to the ecological, social and economic benefits of urban green space on the basis of satisfying their respective ecological niches. On the other hand, the selection of dominant species and associated species in the natural community to build the planting mode, plant species are rich, can show a wealth of seasonal changes and landscape effects, at the same time, a large number of local plants also show a strong landscape characteristics.

The key point of simulating natural community for plant landscape construction is plant material supply. On the one hand, the investigation site of the natural plant community in this study is located at a high altitude of more than 1,000 m. Some species like hornbeam, liudaomu and sarin like cold and cool climate, which has an adaptation process to the ecological environment of the plain area. Therefore, the introduction and domestication of plants become necessary. On the other hand, there are also some plant species that have been successfully domesticated but have not been fully utilized and marketed, such as deutzia large-flower, deutzia small-flower, tuzhuang spirea, and dilla spirea. As early as in the 1980s and 1990s, it was proposed that it should be vigorously promoted and applied as shade tolerant undergrowth, and its introduction and domestication work had been completed long ago. However, due to the lag of the market and disconnection with scientific research, a large number of nursery production was not carried out. At present, they can only be seen in botanical gardens and other scientific research and popular science institutions. Therefore, it is crucial to connect experts and scholars with the market.

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