Utilization of plants in ecological restoration——Taking Chongqing Huashan Tianchi Park as an example

Zijing Zhang¹, Yihui Du¹, Yuchao Hu¹, Yi Li¹*

¹ Architectural and Urban Planning Department, Chongqing College of Architecture and Technology, 401331, China
Corresponding author’s e-mail: cqfdc2008@163.com

Abstract. Huashan Tianchi Park, located in the middle of Huashan Forest Park, has a unique geological wonder of sinkhole group. However, due to the existence of sinkholes, there is little water in sinkhole, and the damage of quarrying, the degree of rocky desertification around it is serious, so it needs to be repaired before it can be developed and utilized. Planners have formulated plans to use plants as materials to alleviate the hazards of geological environment, solve the problems of potential ground collapse, slope instability, open-pit quarry and waste soil and slag, make the park "green" and provide a natural ecological park for the masses.

1. Background
Huashan Mountain is located at the south end of Yixue mountain in the south section of Mingyue Mountain in the Northeast suburb of Chongqing city. Tianchi group of Huashan Mountain is located in the middle of Huashan forest park. The landform is a karst trough valley with an elevation of 320-500m at the bottom of the trough, 600-650m at the elevation of the mountains on both sides, and the relative elevation difference is about 150m. The field survey shows that the Tianchi group in Huashan karst trough valley has a unique geological spectacle and a large distribution density, which has high development and utilization value. However, due to the existence of sinkholes, the lack of water storage in Tianchi, and the damage of quarrying, the degree of rocky desertification around Tianchi is relatively serious, which needs to be repaired before it can be developed and utilized to build a unique Tianchi ecological forest park.

In order to make better use of the unique landscape resources and repair the site environment, planners have developed a unique sinkhole ecological forest park based on plants. On the one hand, it can alleviate the hazards of geological environment, solve the problems of potential ground collapse, slope instability, open-pit quarry and spoil, and make the park "green"; on the other hand, it can return to the natural form, rebuild large-scale green open space, and provide a natural ecological park for the masses.

Table 1. Main geological environment problem

| Category                        | Main geological environmental problems                                                                 |
|---------------------------------|----------------------------------------------------------------------------------------------------------|
| Geological hazards and hidden dangers | Sinkhole and karst funnel may cause ground collapse and other geological disasters. It is possible for Sinkhole wall and its steep slope to produce landslide and soil sliding instability, which may lead to geological disasters. The slope of the quarry is steep, and the stability of the slope is difficult. The influence of spoil area on geological environment. |
Groundwater and surface water leakage
Drainage of surface water and groundwater. Sinkhole, crack and leakage at the bottom of Tianchi.

Landform destruction
The construction of industrial square and open-pit mining in the mine will cause the slope deteriorations of the original landform and landscape, and the ecological vegetation will be seriously affected.

Land resource occupation
The main problems are the geological environment of land resources occupied by industrial square and quarry.

2. General design principles of plants

2.1. Protect current state
The vegetation coverage rate of the current forest is high, and the fast-growing trees such as Pinus massoniana are the main ones. The use of native trees, grassland landscape combined with natural ecological green open space, to provide ecological services for people.

2.2. Colorization of vegetation
In order to enrich the plant level and shape the landscape highlights, color trees, flower shrubs, ground cover flowers and so on are added on the basis of the current situation, so as to achieve the seasonal landscape with considerable annual and four seasons.

2.3. Focus on local
In order to improve the survival rate of plants and create a plant landscape with local features, plants with local climate and regional characteristics should be selected as the key tree species, and then a long-term stable vegetation community should be formed.

2.4. Combination of diversity
Plant community diversity can stabilize the ecosystem, enhance the ability of external interference, reduce the impact of death, pest and disease of transplanted plants, and maintain the ecosystem balance and biodiversity in the restoration area.

3. Engineering practice

3.1. Terrain treatment
The terrain belongs to a concave area, that is, the peak cluster valley terrain in the terrain. The concave area has a lower center and a higher surrounding area. There are sidewalks around the concave area, and observation platforms are set up at the peak and hillside area at the entrance. Now there are two scenic spots, which are located at the southwest entrance of the whole planning and the ecological farm area in the northeast, overlooking the whole area. The roads in the park are arranged according to the contour line and ridge line, and try to follow the trend of the mountain.

The road system is divided into three levels, but none of them is open to traffic. It enters fangjiadang area from the ring line of Huashan Forest Park, and the entrance is located in the southwest of higher terrain. Through the narrow entrance zone of Pinus massoniana forest and mixed broad-leaved forest, we can reach the first landscape point. The view point of this landscape is higher, which can overlook Fangjiadang, and the surrounding plants are relatively low, without line of sight occlusion. The second landscape spot is located in the agricultural community of the activity center, with low terrain, which is suitable for close observation of hydrophilic plants on the lake, surrounded by economic forest and rocky desertification plant landscape garden. The main road crosses the entire depression area, the secondary road mainly runs around the lake bank, and the branch roads are distributed in the whole park, dividing the park into 10 areas.
3.2. Plant landscape transformation

In the process of plant matching, with the idea of "one season and one theme", the theme of "visiting flowers in spring to create beautiful spring landscape by using spring flowers, seeking fragrance in summer to present the summer scenery effect of green shade flower border, viewing leaves in autumn to use autumn leaves, autumn flowers and autumn fruits to match gorgeous autumn scenery, enjoying branches in winter evergreen trees, colorful branches and fruits to create seasonal highlights" has been formed. According to the established plant matching principles, pear blossom wintersweet garden, fragrant garden, picking garden, tea garden and citrus garden were built.

3.3. Natural forest transformation

**Pinus Massoniana Forest.** It covers an area of about 1 / 6 of the whole fangjiaodang area. It is mainly located on the ridge and slope, and is distributed in strips and flakes. The dominant species of undergrowth shrubs are Podocarpus, followed by suanpan, Pyracantha fortuneana, Coriaria, Haloxylon and Elaeagnus. The dominant species of herbs are Dicranopteris, Miscanthus, Imperata, fern, etc.

**Broad-Leaved Forest.** It is mainly Cyclobalanopsis glauca + Pistacia chinensis community + bamboo forest, covering about 1 / 7 of fangjiadang park. Shrubs are mainly Rhododendron, Podocarpus, Imperata, epimedium and so on. The bamboo forest sightseeing area is located on one side of the hillside. The planning contents include bamboo forest path and Wangjiang Pavilion.
In the bamboo forest, local materials are used, such as bamboo, stone, wood, etc. as path materials. It is built according to the terrain, mainly to create a rest and walking area. The bamboo can be used as a fence or broken as a material for the bottom of the walking path.

Figure 5. The masson pine forest trail 1.  
Figure 6. The masson pine forest trail 2.

4. Summary
In the process of ecological restoration, we should make full use of the theoretical knowledge and practical experience of various disciplines. In the process of ecological restoration, we should adjust measures to local conditions, make use of slope greening, bag planting technology and drilling seedling planting technology. Under the guidance of the plant configuration principle of protecting the status quo, color vegetation and paying attention to the combination of local diversity, we can make the park "return to green", provide a natural and open ecological park for the masses, and benefit the whole country.

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