STUDY ON PROTECTION OF XINGHU WETLAND IN ZHAOQING

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Abstract: Zhaoqing Xinghu Wetland is a city center wetland. Due to the recent urban development and a lack of supplementary water resources, the landscape pattern of Xinghu Wetland has changed, and the original ecosystem services of the wetland have been degraded. From the perspective of landscape ecology, referring to the Steinitz landscape design method, this question is problem-oriented, asks questions, collects data, and then analyzes the solution to the problem, explores the ecological restoration of Xinghu wetland, partitions the wetlands, and organizes the protection planning in stages. Focus on water environment treatment planning, reduce human interference, and let nature do the work. The implementation results show that the ecological environment of Xinghu Wetland has been effectively restored, and the Steinitz landscape design method has important reference value for ecological landscape design.

1. Introduction

Wetland is an important life support system, which has the potential to continuously provide ecosystem services such as food, raw materials, and water resources for human beings [1], and plays an important role in flood and drought prevention, soil and water conservation, biodiversity protection, and leisure tourism [2-3]. With the large-scale development and utilization of wetlands since the 18th century, natural rivers and waterfront wetlands have decreased sharply, no matter in developing countries or in western developed countries, the trend of the disappearance and degradation of wetland ecosystems is very serious. Due to the impact of Beiling Mountain development and urban development in Zhaoqing Xinghu Wetland, the water quality has deteriorated and the ecosystem has been severely affected.

Ecosystem restoration has been the focus of attention at home and abroad. For example, the Colorado River Ecological Restoration Project, Kissimmee River Ecological Restoration Project, West Lake Ecological Restoration Project, etc., have received extensive attention from international wetland research, but fewer people have achieved ideal restoration due to human intervention. This study takes Zhaoqing Xinghu Wetland as an example to explore the landscape design approach for ecological restoration of urban wetlands. In the early stage of Xinghu Wetland, Zhong Guoqing, Wu Guohua, Li Dabiao, etc. did basic research on Xinghu Wetland from different angles. This study explores the ecological restoration of urban center wetlands from the perspective of landscape design.

2. Research area and research method

2.1. Study area

Xinghu National Wetland Park is located in the urban area of Zhaoqing, Guangdong Province, with geographical coordinates of 112° 26′36″ -112° 30′11″ E, and 23° 03′26″ -23° 05′19″ North

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latitude. The planned area is 935 hectares, including 677 hectares of lake wetlands, which is one of the largest inland freshwater lake wetlands in Guangdong Province. Xinghu Wetland belongs to the south subtropical monsoon climate, with an average annual rainfall of 1650 mm. The main plants are Ficus microcarpa, wild pheasant, Equisetum cirrhosa, and Xanthoxylum.

2.2. Research Methods
From the perspective of landscape ecology, the wetland ecosystem in the center of the city is regarded as a wetland landscape, and the ecological restoration of the wetland is regarded as a landscape design process \[4\]. The six-step landscape design model proposed by Steinitz provided a suitable operational framework for this study. Guided by this framework problem, it ask questions, collect data, and then analyze and solve the problems. The combination of GIS and ecological landscape planning is widely used and ecological planning decisions are made on the Xinghu wetland landscape planning process, including land use and biodiversity analysis.

3. Study on Wetland Ecological Restoration

3.1. problems and challenges
Xinghu Wetland currently has the following problems: First, the water quality of Xinghu is still unstable. It is currently the national Class IV water standard of the National Surface Water Environmental Quality Standard (GB 3838-2002). With the increase of surface hardening rate, the water quality of Xinghu Lake is at risk of further decline. Second, due to the expansion of the city, the residents' production and production in the area will be polluted, which will have a huge impact on wetland ecosystems. Third, most of the earthen plant species in the area are similar. The landscape is relatively single, failing to form their own landscape characteristics, and affecting the quality of Xinghu wetland.

The construction of Xinghu National Wetland Park can further protect the wetland resources of Xinghu, build the brand of Zhaoqing Xinghu Scenic Spot, increase the technological content, and add new highlights. At the same time, the construction of wetland parks will protect water resources (including aquatic plants) and surrounding mountain forest resources. It is of great significance to combine it with a well-established urban ecosystem.

3.2. Functional positioning
Xinghu National Wetland Park is an important part of the ecological system of Zhaoqing City, Guangdong Province, and is the natural "kidney" of Zhaoqing City; it is an important carrier and support for Zhaoqing City as a famous mountain city, a national historical and cultural city, and an excellent tourist city in the country; it is the bright pearl on the Qianli Tourism Corridor of the city; it is the national base for the artificial breeding of rare waterfowl in the wetlands of southern China; it is the wetland ecological science popularization education base in Guangdong; it is a collection of wetland conservation, wetland ecotourism, wetland science popularization education, and flood prevention and flood resistance functions. It is a national-level wetland park; it is a national-level demonstration of urban lake wetland water conservation and purification.

4. Wetland Planning Scheme

(1) Wetland area management and control
The Xinghu Wetland is divided into four functional areas: management service area, bird habitat conservation and restoration area, east Honghu Wetland Ecological Construction Area, wetland and forest recreation area. The purpose of zonal control is to divide the Xinghu Wetland Bird Core Protection Area, implement ecological management and control of wetland ecosystems, and promote tourism and ecological protection in Qixingyan Scenic Area and Xinghu Wetland Park. In the flood-adjusting lake in the eastern district, the land requisition mainly for ponds and agricultural land will be transformed into urban landscape lake wetland mainly for flood control and flood control in the
east of Zhaoqing City, providing residents with places for ecological sightseeing and recreation. In the West District, the quality of the Beidou Wetland and Forest Recreation Area in the world is enhanced, and the plan is to highlight the "old" and "odd" characteristics of the natural beauty of Qixingyan and its long history and culture. It can carry out recreational activities based on natural scenery, ancient cultural and historical sites, research and wetland sightseeing.

Tab 1: Functional zoning table of Xinghu Wetland Core Area

| Region division                        | Geolocation                                                                 | Key protection projects                                                                                       | Improvement measures                                                                                     |
|----------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Management Service Area                | Xinghu East Gate, North Gate, South Gate, West Gate and Songtao Hotel, Wansong Garden and Bohai Building | Focus on retaining the identifying elements of the entrance landscape                                         | Enhance landscape entrance features, clear and remove excess facilities, and restore green space         |
| Bird habitat conservation and restoration area | Yaoyu Island, Tibet Zhuzhu Island, Zhaozhu Island, Yunqi Island, Xiaopizhou Island, and shallow water in the southwest corner of Fairy Lake | Main bird habitats and foraging places, creating different bird habitats                                     | Bird habitat expansion, reconstruction, and ecosystem restoration and reconstruction                     |
| East Diversion Honghu Wetland Ecological Construction Area | Northeast of Wetland Park                                                  | Landscape lake mainly for flood control and flood control                                                  | Land requisition based on ponds and agricultural land will be transformed into ecological tourism and education |
| Wetland and Forest Recreation Area     | Qifeng yan, Yupingyan, Shishiyuan, Tianzhuyan, Apoyan, Toad Rock, Xianzhangyan, seven karst stone mountains, Wansonggang, Rhinoceros hill and Li hu Lake, Fairy Lake, Central Lake and waves Sea and lake    | Natural wetland landscapes and human wetland resources, core scenic spots such as the cliff stone carvings and karst cave wetlands, and other ancient and strange features such as the Fairy Lake Red Crowned Crane Ecological Park | 1. Water eutrophication; 2. Improve science popularization facilities such as education, aesthetics and wisdom. |
(2) Hierarchical protection planning

According to the importance and ecological sensitivity of wetlands in different functional areas, the wetlands in the core area of Xinghu Wetland are protected by three levels (Fig 2). We will focus on protecting the wetland biological communities formed by protecting the habitats of birds and amphibians, such as Yaoyu Island, Tibetan Pearl Island, and Zhaozhu Island.

1) First-level protected area
Scope of protection: including wetlands in bird habitat conservation and restoration areas.
Protective measures: Reasonably design the relationship between species and habitats; restore biological habitats, provide an environment for wild animals to breed and overwinter; place rocks on the bottom and shore to provide habitat for waterfowl and fish [5]; implement strict protection and cruise 4. Visitors are strictly forbidden to enter and strictly control the surrounding noise; the introduction of any harmful alien species is prohibited.

2) Secondary protection scope:
Protection scope: Wetlands in Li Lake and Fairy Lake.
Protective measures: Combine the wetland landscape restoration technology to create the necessary artificial landscapes and multiple habitats, and use native water trees and grasses in the water to beautify the existing environment [5]. Except for planned projects, the construction of other projects is prohibited within the scope of protection; standardize human activities and prohibit the destruction of wetlands and other facilities; strictly control the flow and scale of tourists; except for planned introduced species, prohibit the entry of other alien species.

3) Three levels of protection:
Protection scope: wetlands in areas other than the above protection scope.
Protective measures: It is strictly forbidden to carry out any production projects that damage the ecological environment; the introduction of harmful alien organisms is prohibited; and the water resources are strictly protected and rationally used.

(3) Water environment treatment plan
a) Diversion
It is planned to set up four special diversion pipes at the starting points of Chenkeng, Pangukeng, Dakeng, and Waikeng in the flood drainage channel around Beiling, which will replenish water to Bohai Lake, Central Lake, and Fairy Lake respectively, and strengthen the exchange scope of water bodies and Exchange effect [6]. At the same time, the scouring power of water diversion is appropriately dispersed to avoid excessive suspension of lake sediments and affect transparency and visual effects (Fig 3).

At the same time, after the Xijiang water is treated by sedimentation, it can be injected into Xinghu through the diversion project, and then flow out through the gate to realize the water exchange of Xinghu, and then flow into the urban rivers and rainwater pipes to further improve the water quality of urban rivers and the connection of rivers and lakes; And planting a variety of aquatic plants in the scenic area, thoroughly solving the water quality problem of Xinghu Lake through comprehensive management methods (Fig 3).

b) interception
Pipeline distribution and drainage are all implemented in the planning area; sewage discharge is included in the urban sewage pipe network and cannot be discharged directly to the lake. In order to ensure the water quality in the planning area, the drainage ditch in the outer pit will be connected to the municipal municipal pipe network in the future. It will not be directly discharged into Xinghu, and will be discharged after being treated to meet the standards. Domestic sewage from residents of Shipai Village and Yanqian Village in the planning area is discharged into the urban municipal pipe network through the sewage pipeline in the scenic area (Fig 3).

c) Dredging and dredging
It requires regular dredging of all lakes in the planning area to remove deposited eutrophic substances and avoid pollution to the lake; increase the internal connection and connection of the lake
water, especially the central embankment, the water moon embankment and the Baizhang embankment, increase the landscape bridge, and strengthen the water flow and Through (Fig 3).

Fig 3: Water system planning diagram

Fig 4: Xinghu Coastline Functional Zoning Map

(4) Wetland shoreline planning

According to the functional characteristics of the shoreline, the waterfront shoreline around the Star Lake is divided into four types: residential shoreline, landscape trail shoreline, leisure tourism shoreline and ecological natural shoreline (Tab4) (Tab2).

Tab2: Revetment planning table

| Waterfront shoreline type       | Planning Lot                          | status quo                                      | Corrective measures                                           |
|---------------------------------|---------------------------------------|-------------------------------------------------|---------------------------------------------------------------|
| Residential lifestyle shoreline | West of Bohai Lake, Center Lake, Xinghu Avenue | Dominated by hard moorings, emphasizing hydrophilic facilities | Designing hiking trails and residents' fitness facilities |
| Landscape trail shoreline      | Torii Plaza area                      | Dominated by rigid vertical banks, landscape corridors and pedestrian systems | Waterfront plaza, hydrophilic platform |
| Leisure sightseeing shoreline  | Baizhang dike, Shuiyue dike, Yanqian village, Shipai village area | Dominated by hard moorings | Mainly rigid vertical and retreat shoreline, with a unique theme space for business and leisure sightseeing |
| Ecological natural shoreline   | North side of Xinghu, wetland park area | Dirt slope                                      | Grassy slopes and aquatic plant banks with wooden planks     |

5. conclusions and discussion

From the perspective of landscape ecology, this study considers the Xinghu Wetland as a landscape ecosystem. Using the landscape ecological design method proposed by Steinitz, it explores the landscape design approach of Xinghu Wetland restoration. Through zone control, the ecological wetland is protected in stages and the water environment is treated, Zoning the wetland shoreline, restoring the ecosystem, and further reducing man-made excessive disturbance to the wetland ecosystem. Restoring wetland ecosystems is mainly to allow nature to do work and restore seasonal wetlands and habitats. It needs to play the role of the ecological island as a star lake wetland fish and reptile, bird habitat and migration corridor, restore the wetland plant communities dominated by native plants, create a variety of habitat types, and promote the protection of biodiversity [4].

There are many urban wetland systems like Xinghu in our country. In recent years, under the great economic pressure of urban development, many urban wetlands have been developed by tourism. Development activities have disrupted biodiversity and affected wetland ecosystem services. Such interference is difficult to remove. In recent years, the wetland system has implemented wetland
restoration, but the effect is not obvious.

This article focuses on the restoration of landscape planning for wetland ecosystems, but other restoration approaches are also needed, including changing garden tree species, artificially selecting native plants to promote wetland habitat restoration, and adjusting the internal water system of wetlands to create suitable aquatic habitats, etc., which have not been discussed in detail. Reducing the disturbance of tourist activities to wetland ecosystems and promoting the full use of ecosystem services, such as the interference modes that humans can use in the ecological process, and how to establish a balance between human interference and wetland resilience; Scientific research and education facilities, and the use of aesthetic enlightenment services, etc., need further study in later articles.

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