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Analysis of Ecological Landscape from the Perspective of Environmental Protection — Taking the Planning and Design of Xi'an Chanba Wetland Park as an Example

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Abstract: *A wetland is the ecological landscape with the richest biodiversity on the earth and one of the most important living environments for human beings. With people's in-depth understanding of the environmental protection benefits and social benefits of wetlands, the construction of wetland parks has become the development direction of wetland protection and utilization. Based on the investigation of the status quo of wetland bird watching tourism and the analysis of the development principles and design objectives of the wetland bird watching park, this paper proposes measures to improve the bird habitat in the wetland bird watching park and the activities of the wetland bird watching park. A tentative discussion was made on the design of the Wetland Bird Watching Garden.*

Keywords: *Wetland park, Environmental protection, Ecological landscape*

1. Introduction

Wetlands are important land resources and natural resources. Nowadays, everyone's understanding of the environmental protection benefits and social benefits of wetlands is gradually deepening. The construction of wetland parks has become an important development direction for wetland protection and utilization. The water system of every city is crucial to the construction of the city and the survival of human beings. From an ecological point of view, many areas, especially waterfront areas, are areas with biodiversity characteristics. When we improve the urban landscape environment, we need to pay attention to other creatures that also live here, so as to protect the biodiversity.

2. Review

2.1. The concept of wetland park

Wetland Park is similar to a small protected area, but it is different from the concept of a nature reserve and a general park. According to the current trend of wetland protection and management at home and abroad, wetland landscape areas with functions of species and habitat protection, ecotourism and ecological environment education can be called "wetland parks" [1].

2.2. Significance and function of wetland parks

2.2.1. Ecological significance and function

Wetland parks have five ecological significance and functions: (1) protect biological and genetic diversity; (2) slow down runoff and store floods and prevent drought; (3) fix carbon dioxide and regulate regional climate; (4) degrade pollution and purify water quality; (5) wave protection and shore strengthening [2].

2.2.2. Significance and function of recreation and tourism

Wetland parks emphasize the protection and display of the ecological characteristics and basic functions of wetland ecosystems, and the way to solve the problems of funding sources and benefit

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utilization for wetland park protection is to develop "wetland tourism" [3].

2.3. Design of Wetland Bird Watching Garden

2.3.1. Overview of wetland bird watching tourism

The diversity of the wetland ecological environment, landscape and species diversity make the wetland the habitat of many rare birds. According to statistics, there are more than 300 kinds of birds living and breeding in wetlands in China alone, accounting for about 100% of the number of bird species in the country. 1/3, 50 % of the more than 40 first-class protected bird species announced by the state live in wetlands [4]. Therefore, wetlands are high-potential areas for developing bird-watching tourism.

2.3.2. Investigate the status quo of wetland bird watching tourism resources

(1) Status of wetland biological resources. Wetlands usually have sufficient sunlight and humid air, and are good natural areas for many animals and plants; the rich nutrients in wetlands provide food resources for benthic animals and fish, and tidal flats provide habitats for birds; rich benthic animals and aquatic animals Provides food resources for birds.

(2) Main Factors Affecting Bird Habitat. (a) Invasion of alien species; (b) The drying up of fishponds in artificial wetlands has caused a large number of birds to fail to inhabit; (c) Overfishing operations have disturbed the normal habitat of birds; (d) The choice of habitats for birds has decreased [5].

2.3.3. Development Principles of Wetland Bird Watching Park

(1) Principles of environmental protection and sustainable development. Wetland bird tourism belongs to the category of ecotourism. Ecotourism emphasizes that economic benefits must be subordinated to ecological benefits. In the process of tourism development, it is necessary to satisfy tourists' psychology without damaging resources and the environment. Therefore, the policy of sustainable development strategy must be implemented.

(2) Principles of ecological aesthetics. The design of the Wetland Bird Watching Garden should highlight the natural beauty of the wetland and try to avoid too many artificial carvings. The service facilities in the park should be in harmony with the surrounding environment, reflect the harmony and unity of nature, and increase humanistic scenery in a timely and appropriate manner [6].

(3) Priority principle of environmental education. The education of bird knowledge is one of the main functions of the Wetland Bird Watching Garden. When planning and designing, the awareness of protecting birds should be reflected, so that residents can consciously love birds after watching birds.

2.3.4. Establishment of supporting facilities for bird watching

Carrying out bird watching activities requires complete supporting facilities. Introduce wetland bird tourism information to tourists, and also set up a bird knowledge consultation service station, with simple and vivid bird knowledge manuals, bird watching guides (mainly including bird watching time, place and precautions), set up some bird rescue stations, treatment homes, etc. [3].

3. Planning and Design Description

3.1. Project overview and analysis

3.1.1. Location analysis

Xi'an Chanba National Wetland Park is one of the 20 National Wetland Parks approved and established by the State Forestry Administration in 2008. It is located at the confluence of the Bahe River and the Weihe River. It is distributed along both sides of the Bahe River embankment (Figure 1). Located between 108°58′16.96″-109°01′35.19″ east longitude and 34°24′42.97″-34°26′05.26″ north latitude, the wetland park has a total area of about 4.27km^2.

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Figure 1: Location analysis

3.1.2. Status Analysis

(1) Due to the dredging and quarrying of sand all year round and the excessive mining of sand and stones in the Bahe River, the riverbed of the river has been seriously damaged, and the deep pools and Jixintan are densely distributed in the river, which seriously affects the smooth discharge of the Bahe River;

(2) The overall topography of the site is high in the south and low in the north, high in the west and low in the east;

(3) The roads are mainly suburban roads and rural roads, mainly cement and loess roads, with low road grades and poor road infrastructure (as shown in Figure 2);

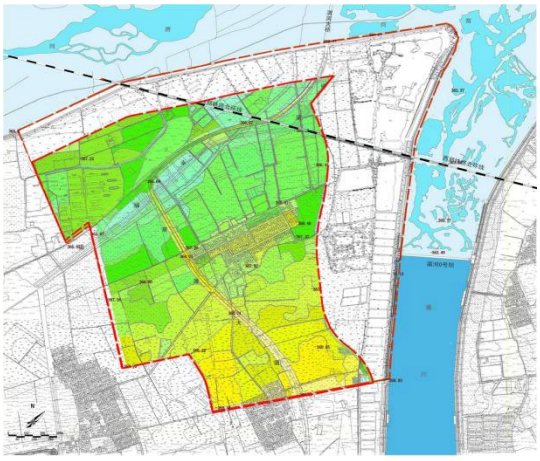

Figure 2: Analysis of current situation

(4) The current factory area is basically abandoned, and the current factory buildings are mainly brick structures and brick-wood structures, which belong to the construction type aided by the Soviet Union, and the construction quality of individual buildings is relatively good; Gas stations and management rooms, pipeline management rooms, some abandoned rooms, and farmland, nursery and other management rooms. The average number of storeys in this type of building is low, and the construction quality is generally poor.

(5) All kinds of wet plant communities have been severely damaged due to long-term industrial and agricultural production activities and human interference, and have degenerated to form secondary plant communities, and their ecological functions are very fragile.

3.2. Planning Basis and Planning Principles

3.2.1. Planning Basis

International relevant laws and regulations: (1) "Convention on Wetlands of International

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Importance Especially as Waterfowl Habitat" (1971); (2) Convention on Biological Diversity (1992).

Relevant domestic laws and regulations: (1) "National Wetland Protection Project Planning" (2003); (2) "National Urban Wetland Park Management Measures" (Trial) (2005); (3) "China Urban Wetland Park Protection Outline" (2005); (4) "Guidelines for Planning and Design of Urban Wetland Parks" (Trial Implementation) (2005); (5) "Technical Guidelines for Planning and Design of Urban Wetland Parks" (2006); (6) "National Wetland Park Construction Specifications" (2008); (7) "National Wetland Park Evaluation Standards" (2008); (8) Guidelines for Overall Planning of National Wetland Parks (2010); (9) "National Wetland Park Management Measures" (Trial) (2010); (10) "National Wetland Park Pilot Acceptance Measures" (Trial) (2010); (11) Notice of "National Wetland Park Acceptance Measures (Trial)" (2010).

Host planning: (1) "Xi'an Chanba National Wetland Park Project Feasibility Study Report" (2008); (2) "Xi'an Chanba National Wetland Park Master Plan (2009-2020)" (2009); (3) "Regulatory Detailed Planning of Xi'an Chanba National Wetland Park (2009-2020)" (2009); (4) "Xi'an Chanba National Wetland Park Regulatory Detailed Planning and Core Area Constructive Detailed Planning (2009-2020)" (2009) (Figure 3).

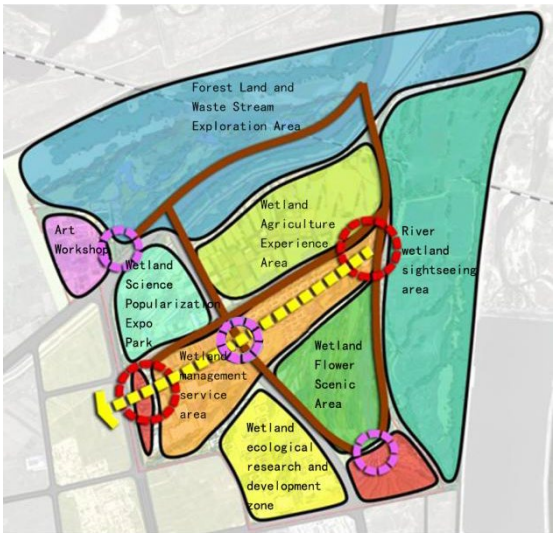

Figure 3: Planning structure

3.2.2. Planning structure

(1) One axis: wetland tourism service axis; (2) Three circles: three circles of wetland restoration, display and experiment; (3) Five points: two main and two portal nodes, and one park core node; (4) Fifth line: park Two horizontal and three vertical, a total of five main traffic axes; (5) Eleven districts: Eleven functional divisions of the park.

3.3. Design goals

(1) Focusing on protecting wetland ecosystems and biodiversity and saving rare and endangered species, restore degraded vegetation and water bodies, restore original wetland landscapes, and provide habitats for birds.

(2) Focus on the protection and rational use of natural resources of Hongze Lake Wetland, and promote the harmonious development of the Bird Watching Park and surrounding areas.

3.4. Design Concept

3.4.1. The ecological concept of "flow-gathering"

(1) Flow and collection of rivers, runoff, and canal water

(2) Habitat, landscape, energy flow and collection

(3) Recreation, Behavior, Perceptual Flow and Convergence

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3.4.2. Recreation concept of "garden and belt"

(1) Earth and Water - Blue Belt, Blue Garden

(2) Human beings and life - the red belt, the red garden

(3) Life and Nature - Green Belt, Green Garden (Figure 4)

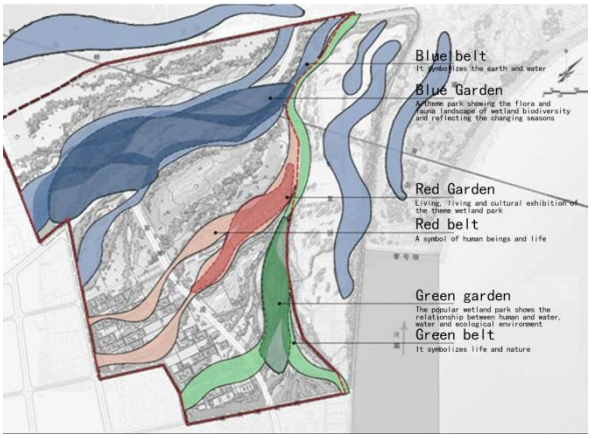

Figure 4: Design Concept

3.4.3. "Circle layer" layout concept

According to the degree of human intervention on wetlands and the degree of penetration of nature into the city, wetland parks are laid out in circles. It is divided into four circles, the two-river beach ecological conservation layer, the riverside wetland restoration layer, the wetland tour display layer, and the artificial wetland experiment layer, gradually transitioning to the city. The ecological protection layer of the Lianghe River Beach is basically not touched by tourists; the riverside wetland restoration layer allows tourists to contact and carry out a small amount of activities; the wetland tour display layer is the main area for tourists to contact and intervene in the wetland; the artificially constructed wetland experimental layer is mainly for wetland technology research and development and project experiments. (Figure 5)

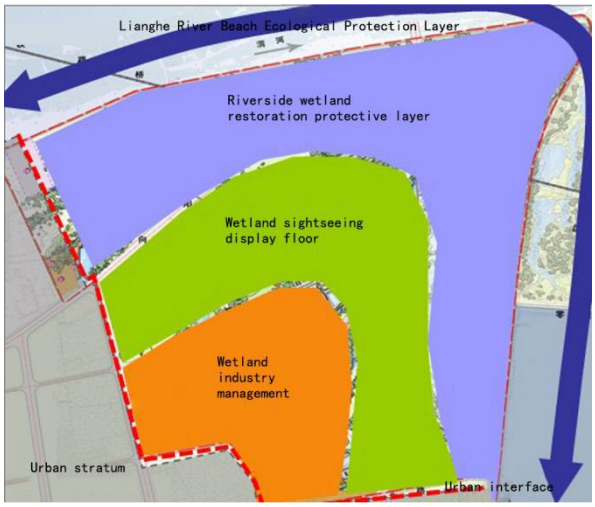

Figure 5: "Circle layer" layout concept

3.5. Landscape function zoning planning

The large-scale planning has clear movement and quietness, and the more noisy human activities are limited to the area closer to the entrance, and the deeper the park is, the quieter it becomes.

3.5.1. Popular science education area

The woods on both sides of the path from the entrance to the wetland aquatic plant pool play an ecological role while enhancing the sense of space, making people feel suddenly enlightened when they

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pass through the woods and see a large wetland aquatic plant pool.

3.5.2. Bird Habitat Display Area

Starting from the goal of protecting the hidden and quiet environment in the park, the simple and plain garden roads and building facilities are the mainstays, and the original roads are used as much as possible, so that people can get close to the most natural living conditions of birds, and at the same time, disturb the birds drop to lowest.

3.6. Road Traffic Planning

Road classification: The park plans to set up three levels of garden roads. Among them: the first-level garden road, 6 meters wide, according to the "two horizontal and three vertical" layout, establishes the basic traffic skeleton of the park, connects the various divisions inside the park, and also serves as a fast emergency channel. The secondary garden road, with a width of 4 meters, is the main road in the sub-area, connecting the main areas and main scenic spots in the sub-area, and serving as an emergency passage. The third-level garden road, with a width of 1.8 to 2.4 meters, is a secondary road in the subregion, connecting the secondary scenic spots in the subregion.

3.7. Planting Planning

3.7.1. Design Principles

Following the principle of species diversity and reproducing nature, it embodies the gradual change characteristics of terrestrial-wet-aquatic ecosystem, and the plant ecotype changes from terrestrial trees, shrubs and grasses-wetland plants or emergent plants-floating leaf plants-sinking plants. water plants etc.

3.7.2. Plant Configuration

Terrestrial plants: (1) keynote tree species; (2) upper wood; (3) middle wood, lower grass; (4) vines.

Hygrophytes: (1) Emergent plants; (2) Floating plants; (3) Floating plants; (4) Submerged plants.

Four Seasons Landscape: (1) Spring (viewing flowers); (2) Summer (viewing flowers and fruits); (3) Autumn (viewing leaves, flowers and fruits); (4) Winter (viewing leaves).

3.8. Vertical Design

There are four aspects: (1) Planning principle (2) Road vertical (3) Site vertical (4) Earthwork calculation.

Make full use of the original terrain resources of the site and the earth excavated by the river dredging project around the site to create a natural wetland terrain with a developed water system and scattered islands, which reduces the flow rate of the river and makes the waters more suitable for the survival of aquatic animals and plants, thereby attracting birds to come here perch. The undulations of the terrain subtly separate the space under the premise of natural beauty, so that the construction of each district interferes with each other.

3.9. Landscape Node Analysis

3.9.1. Wetland Aquatic Plant Pool

Among them, the large trees planted scatteredly provide the necessary shade for tourists in summer without affecting the light requirements of aquatic plants.

3.9.2. Bird Watching Gazebo

At the height of the bird watching platform, you can overlook the western landscape of the bird watching park, creating a landscape of the façade of the park (as shown in Figure 6).

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Figure 6: Intention map of bird watching observatory

Wetland is a kind of complex ecosystem, including substrate, microorganisms and vegetation [7]. Wetlands will play a variety of roles such as carbon sequestration, material production, climate regulation, pollutant degradation, water storage, animal habitat, ecological education, and social benefits. In addition to the value of natural appreciation and environmental protection, the wetland also has a certain value of tourism and entertainment. However, landscape design is always carried out on a certain site, and human activities will more or less interfere with the natural environment. In this process, we have to take into account the living environment of biomes in urban areas. Combining wetland design with garden design, using plants to rationally allocate water body space, not only reflects the diversity of wetlands, but also makes the planning of wetlands more hierarchical. For the shore landscape design, the embankment in the wetland environment is relatively steep, and the gentle slope can be used to design the embankment, which can improve the sense of design and improve the safety of tourists while visiting [7].

In view of the problems existing in the current urban landscape design, we need to reflect on the relationship between ecological environment protection and landscape design. Ecological environment protection belongs to the core part of environmental protection and complements landscape design, so landscape construction is carried out under the concept of ecological environment protection. As a designer, we should do our best to reduce intervention, promote the play and embodiment of the ecological function and value of nature itself, use the principles of ecology to formulate the optimal design plan, maximize the material utilization and energy cycle of the natural system, and maintain the natural environment of the site. The process and the original ecological pattern, enhancing biodiversity, allowing biota to thrive, and achieving sustainable development of the ecological environment are also the most essential requirements of low-carbon cities. The ecosystem itself has a strong self-sustaining and self-recovering ability, and this can be fully utilized in landscape design to allow nature to serve humans, which not only saves construction costs but also reduces waste generation. We should start from the current situation, combine the natural conditions of the area to implement comprehensive layout and overall design, and focus on strengthening the protection of the natural ecological environment. Through large-scale and planned scientific development, while making full use of the advantages of ecological resources, it is also necessary to strengthen the application of humanistic elements, organically combine ecological landscapes with humanistic landscapes, and respect the laws of nature before any activities or actions On the basis of human resources, the ecological environment cannot be destroyed wantonly, so as to form a harmonious and unified relationship between man and nature, so as to realize the harmonious development of human society and the natural environment. Landscape is the material carrier of regional culture. In landscape design, scientifically apply the principles of landscape ecology and contrast, borrow, separate, frame, lead, separate, group, obstruct, perspective, and separate The surrounding natural environment and cultural landscape are integrated together to form a reasonable layout, well-organized, concise and generous landscape space and a reasonable landscape layout. At the same time, landscape design should be adapted to local conditions, fully consider the surrounding environment and hydrogeological conditions, reduce the waste of resources and the impact on animals and plants, build an ecological landscape, and coordinate with the ecological process to minimize the impact on the environment. An environmentally friendly and energy-saving landscape that is in harmony with the surrounding environment can truly improve people's living environment and realize the harmonious development of man and nature.

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4. Conclusion

The diversity of the wetland ecological environment, landscape diversity and species diversity make the wetland a habitat for many rare birds, and the wetland bird watching park has naturally become an important part of the wetland park. We need to establish the concept of ecology in our minds and fully consider ecological design: (1) maintain the continuity and integrity of the wetland system; (2) maintain the biodiversity and stability of the wetland; (3) maintain the scientific nature of the development and utilization of wetland bird watching resources. Through the balance of ecological protection and wetland bird watching tourism, the Wetland Bird Watching Park can highlight the diversity of landscapes on the basis of protecting and reusing the fragile habitat of wetlands, improve the value of recreation and sightseeing, and make ecological protection and recreation develop harmoniously.

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