### **Balancing Bird Habitats and Production Systems**

Chonghu National Wetland Park Master Plan

**Project name:** Balancing bird habitats and production systems: Chonghu National Wetland Park Master Plan

Project address: Gong'an County, Hubei Province, China

**Area:** 15.9 km2

Year of planning: 2022 (Unbuilt)

**Award Category:** Analysis and Planning (Unbuilt Category)

### **Project statement**

Chonghu Lake, located in Gong'an County, Hubei Province, China, is a typical representative of the lake groups in the middle reaches of the Yangtze River. The area has abundant flora and fauna resources, making it an important stopover on the East Asia-Australia migratory bird route. It was designated a Wetland of International Importance in 2023, recognized for its species diversity and significant natural conservation value. However, due to global climate change and agricultural industrialization, many issues such as lake shrinkage, and pollution caused by surrounding agriculture and aquaculture have posed severe threats to the sustainable development of Chonghu Lake.

Based on systematic surveys and research, and in collaboration with bird experts, wetland specialists and government, the master plan of Chonghu National Wetland Park aims to achieve a balance between bird habitats and production systems through four steps: controlling agricultural pollution, restoring wetland habitat, building recreation systems, and driving rural development.

This project addresses comprehensive wetland management and agricultural optimization in the face of current challenges. It also integrates the development of the park and its surrounding areas, injecting new vitality into regional economic and social development. It provides valuable experience and a model for lake wetland planning.

#### **Project narrative**

#### 1.Background

Chonghu Lake, located in Gong'an County, Hubei Province, China, was formed in the early 19th century and is a typical representative of the lake groups in the middle reaches of the Yangtze River. The area has fertile soil and abundant flora and fauna resources, making it an important stopover on the East Asia-Australia migratory bird route. It was designated a Wetland of International Importance in 2023, recognized for its significant natural conservation value and ecological sensitivity. At the same time, this area has been known as a land flowing with milk and honey historically, characterized by an integrated farming and fishing production model. The farmlands here exhibit a grid-like texture, with each grid serving as a unit of agricultural production interconnected by canals. Within these grids, three different land use methods have emerged: the rice-crayfish co-culture model, aquaculture, and rice-aquaculture co-culture. The most distinctive is the rice-crayfish co-culture model, where locals dig channels in the rice paddies to rear small crayfish. This practice involves alternating rice cultivation with crayfish rearing, enhancing production efficiency and reflecting the traditional Chinese wisdom in sustainable production.

However, due to global climate change and agricultural industrialization, several issues such as lake shrinkage and degradation, eutrophication from aquaculture, the prevalence of homogeneous habitat types and species structures, and inadequate surrounding infrastructure pose severe threats to the sustainable development of Chonghu Lake. Therefore, achieving a balance between bird habitats and production systems is the primary focus driving the Chonghu National Wetland Park Master Plan.

#### 2. Process and strategy

During the planning phase, the project adopted a collaborative approach involving multiple stakeholders. The project team invited bird experts, wetland specialists, and agricultural experts to provide professional guidance and detailed data support, especially concerning wild-life, agricultural planting, and water flow direction. Close cooperation with wetland experts from the International Union for Conservation of Nature (IUCN) ensured the scientific integrity of the planning. Additionally, the project team frequently engaged in communication with government and non-governmental organizations to ensure the feasibility of the planning and construction efforts.

The project follows four steps in sequence: controlling agricultural pollution, restoring wetland habitats, building recreation systems, and driving rural development, to create a comprehensive ecological-cultural system. Among them, controlling agricultural pollution is a pre-requisite for project implementation, focusing on controlling pollutant emissions and purification at the source to safeguard habitat enhancement. Restoring wetland habitat serves as the foundation of the project, being the most critical step in providing suitable habitats for birds and other wildlife, and laying the groundwork for other wetland development activities. Building recreation systems builds upon the first two steps, providing venues for public engagement in nature education, wetland excursions, and ecological research. Driving rural development aims to integrate Chonghu Lake with 17 surrounding villages, fostering mutual service provision and coordinated development to collectively create a prosperous future for Chonghu Lake.

#### 2.1 Production systems

The project has established a pond-channel wetland complex system, characterized by ponds as points and channels as lines. This system comprises three main components: (1) Pollution source control: 124 ecological ponds in farmland are set up to guide the collection, sedimentation, and preliminary filtration of non-point source pollutants, while the reduced use of chemical fertilizers is encouraged. (2) Process transmission purification: 246 km of ecological channels receive wastewater from the ecological ponds, where plants filter out nitrogen and phosphorus to reduce water pollution. (3)Artificial wetland purification: Approximately 2 km² of artificial wetlands serve as the final interception barrier. Plants, microorganisms, and soil substrates in the Artificial wetlands further purify the pollutants. This complex system promotes the growth of green plants through the recycling of nutrients and water, achieving the resourceful and harmless treatment of pollutants.

#### 2.2 Habitat system

The project has restored a variety of habitats suitable for bird activities through the following steps: (1) The project identified six key water-fowl species for protection according to the IUCN Red List and China National Protection Class, which can indicate the quality of the wetland habitats. (2) The project reshaped six different wetland habitat models with varying vegetation and water depth, meeting various needs of birds for resting, short stays, and long-term residence. (3) By altering the lake's depth and shaping the terrain, and by selectively stocking small aquatic animals, the project provides the material resources needed for bird habitats and attracts other surrounding wildlife. With the optimization of the habitats, a remarkable number of species will soon emerge.

#### 2.3 Recreation system

The project has established a recreation system consist of nature education, wetland excursions, and ecological research. Specifically: (1) The nature education module plans a series of activities such as knowledge lectures, sketching sessions, and art exhibitions based on different phenological phases and seasons. It also includes the construction of bird and fish display gardens to provide pathways for the public and nature enthusiasts to understand the wetlands. (2) The wetland excursion module includes the development of a slow travel system, including walking trails, bicycle paths, and rest stations, providing opportunities for visitors and local residents to relax, unwind, and connect with nature. (3) The ecological research module involves setting up water quality monitoring station, bird monitoring station, bird research center, etc., providing a solid assurance for wetland management and maintenance. It also serves as an off-campus research base for nearby universities.

#### 2.4 Rural development

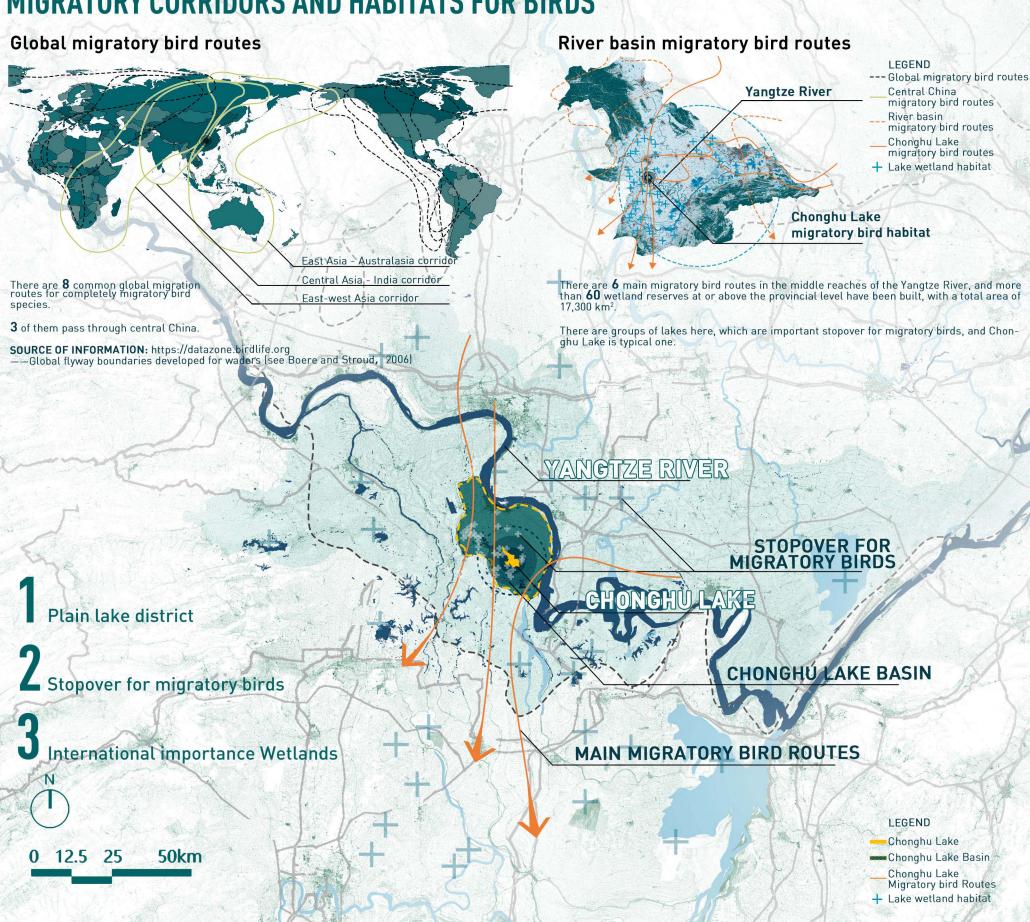
The project has planned a modern agricultural cluster around Chonghu Lake, forming a new model of coordinated development with 17 surrounding villages. On one hand, each village leverages its unique agricultural resources to develop distinct rural industrial models, providing necessary visitor dining, accommodation services for Chonghu National Wetland Park. On the other hand, Chonghu National Wetland Park continuously brings in tourist resources due to its excellent wetland resources. Benefiting from the services provided by the villages, there is no need for extensive construction of related service buildings within the park, which also protects the ecological environment of Chonghu.

#### 3. Project summary

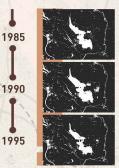
The project reflects scientific and systematic integrated management of wetlands and optimization of agricultural practices in response to challenges posed by climate change and agricultural industrialization. This effort has enriched lake habitat diversity and enhanced biodiversity. It also coordinates park development with surrounding areas, injecting new vitality into regional economic and social development. The comprehensive plan for Chonghu National Wetland Park offers a strategic framework for the protection and development of Chonghu Lake, an internationally significant wetland, and provides valuable insights and examples for planning other important lake wetlands globally.

## **BACKGROUND**

### MIGRATORY CORRIDORS AND HABITATS FOR BIRDS



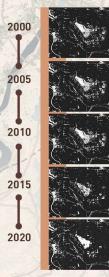
### HISTORY OF WETLAND CHANGE



#### 03 1980s - 2000s Increase in pollution

The dam were built to divide the lake into north and south.

Pollution caused by the rapid development of livestock, poultry and aquaculture



#### 04 2000s - 2020s Ecological wetland

Since the Three Gorges Project, ecological functions of the lake have been highlighted.

2014: National wetland park pilot construction unit.

2019: National wetland park.
2023: Wetland of International Impor-

Chonghu Lake Yangtze Dongqinghe River

01 Ancient time-Beginning

In 1835, due to the earthquake, the land subsidence became a depression lake, Chonghu began to be called "Chenhu Lake".

Later, due to flooding and silt accumulation, the Dongqing River, a tributary of the Yangtze River, was isolated from the sunken lake. It is the largest wetland in the flood diversion area.

#### 02 1950s - 1980s Lake area reduction Yangtse River

Chonghu Lake
The fishery was established, and the area of

The lake is two or three meters deep, with natural fishery and herds of

the lake was gradually

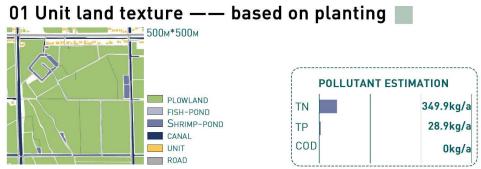




Chonghu Lake, located in Gong'an County, Hubei Province, China, was formed in the early 19th century and is a typical representative of the lake groups in the middle reaches of the Yangtze River. It was designated a Wetland of International Importance in 2023, recognized for its species diversity and significant natural conservation value.

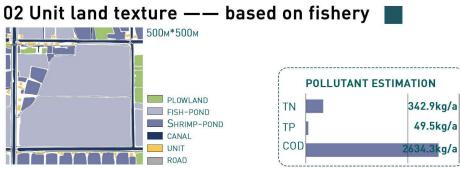
### **BACKGROUND**

### PRODUCTION MODEL



The overall water flow direction is from north to south, and the interior is drained and irrigated by artificial ditches.

MAIN CROPS: rice, upland rice, wheat, rape, cotton, etc POLLUTION SOURCES: fertilizers, pesticides and mulch



The overall direction of water flow from north to south

MAIN FISHES: Pelteobagrus, eel, loach, crayfish, turtle, etc POLLUTION SOURCES: bait, large amounts of feces produced by fish and shrimp, and remains

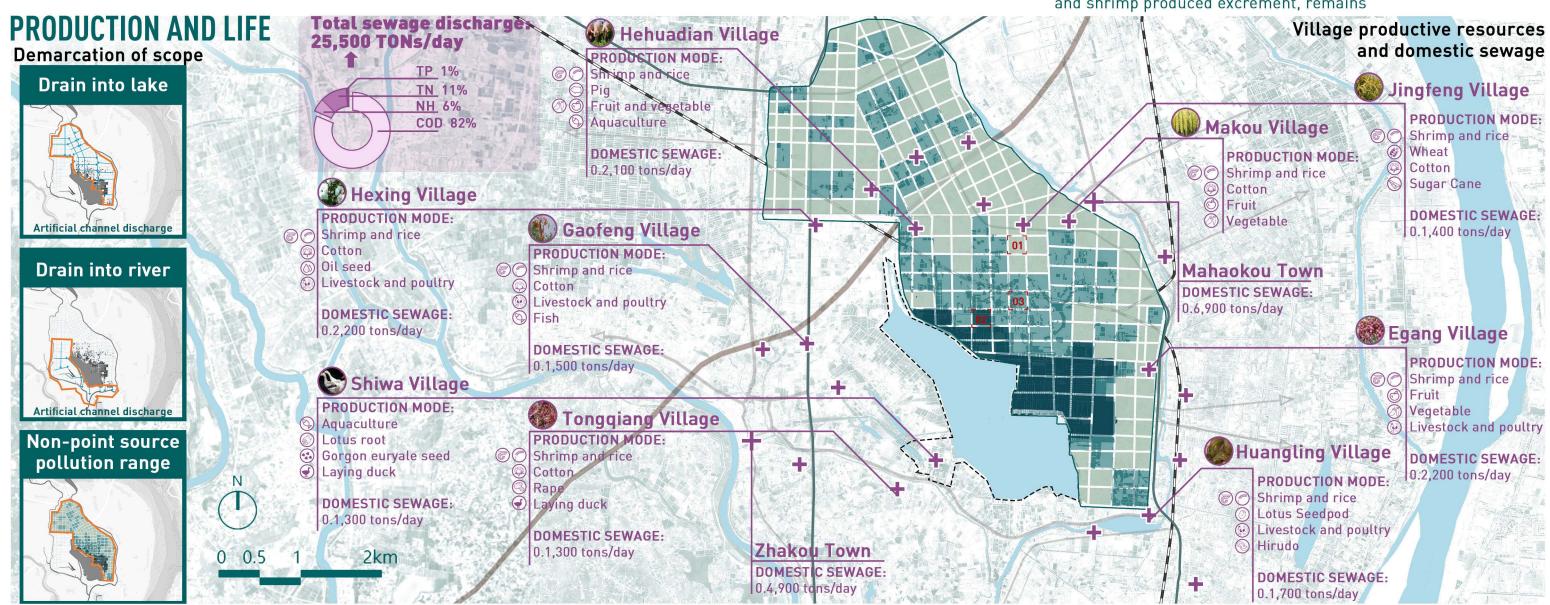


The overall water flow direction is from north to south.

The internal drainage and irrigation are carried out through ditches and culverts.

MAIN CROPS&FISH: rice, upland rice, wheat, etc. Yellow catfish, crayfish, etc

**POLLUTION SOURCES:** fertilizers, pesticides and mulch and fish and shrimp produced excrement, remains



This area has been known as a land flowing with milk and honey historically, characterized by an integrated farming and fishing production model. The farmlands here display a grid-like pattern, with three distinct land use methods within each grid, reflecting the traditional Chinese wisdom in sustainable production.

# **CHALLENGES AND OPPORTUNITIES**

**BIRD HABITATS PRODUCTION SYSTEMS** Eutrophication reduce open-air water area CHALLENGES etland purification poten POTENTIAL MIGRATORY BIRD HABITAT · Returning farmland to lake, restored the water area COMPOUND AGRICULTURE AND FISHERY INDUSTRY Stationary wetland Unified the direction of water entry HOW TO BALANCE? Constructing animal and plant gene library Regulating multi-level production POTENTIAL OPPORTUNITY **FUTURE POSSIBILITY** 

Due to global climate change and agricultural industrialization, many issues such as lake shrinkage, and pollution caused by agriculture and aquaculture have posed severe threats to the sustainable development of Chonghu Lake. Therefore, achieving a balance between bird habitats and production systems is the primary focus driving this project.

### PROCESS AND SITE PLAN

### **PROCESS**



Lake evolution



Agricultural model



Habitat types



Industry situation

 Low-impact production systems

- Rich bird habitats
- Comprehensive recreation systems
- Diverse rural Industries

#### **METHODS**

Field study Interviews Document Space analysis



Guidance from different experts



### (Fr

IMPLEMENT

Controlling agricultural pollution



Restoring wetland habitat



· Building recreation systems



Driving rural development

-40%

+202ha

Agricultural Area of pollution restore

Area of restored habitat

5-YEAR GOAL

-68% Agricultural

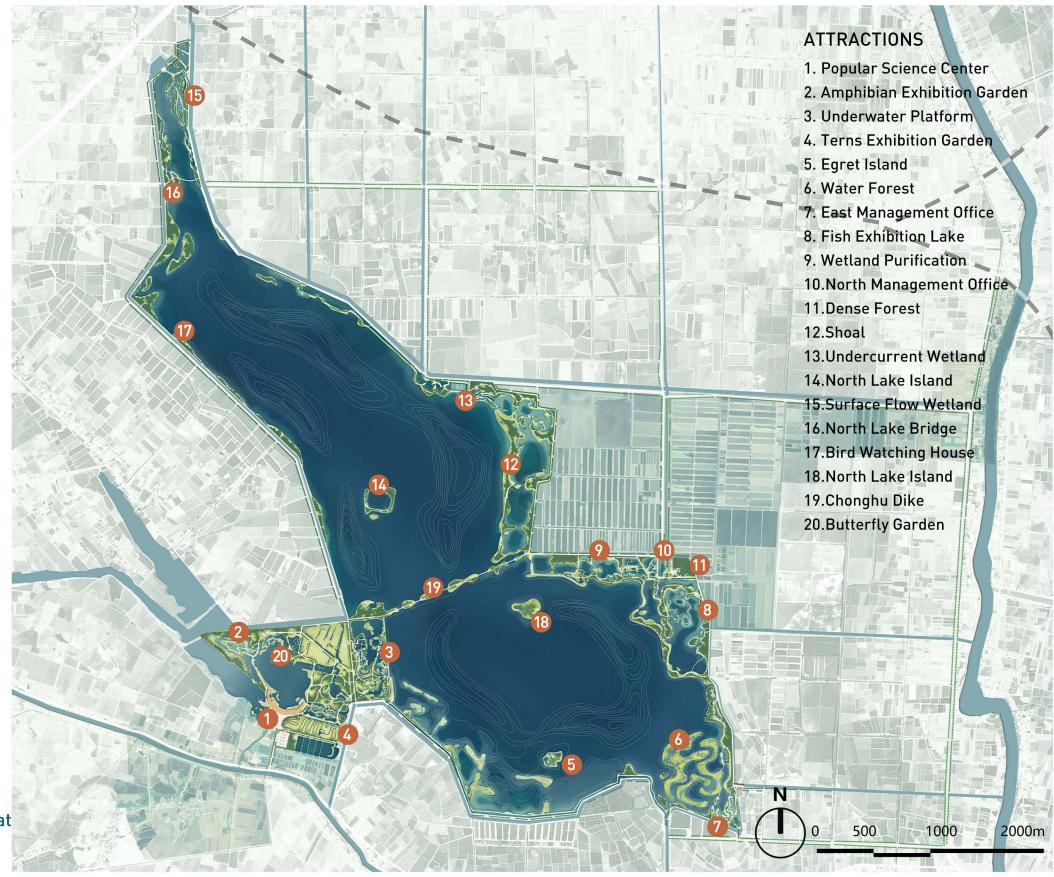
pollution

+401ha
Area of restored habitat

15-YEAR GOAL



#### **SITE PLAN**



Based on surveys and research, and in collaboration with experts and government, the master plan of Chonghu National Wetland Park aims to achieve a balance between bird habitats and production systems through four steps: controlling agricultural pollution, restoring wetland habitat, building recreation systems, and driving rural development.

## **PART1: PRODUCTION SYSTEMS**

### POND AND DRAINAGE WETLAND COMPLEX SYSTEM

# Step 1 POLLUTION SOURCE CONTROL

Guiding surface source poltlution into ecological ponds for purification.

Unit land texturebased on planting

43.48km<sup>2</sup>

Unit land texturebased on fishery

7.15km<sup>2</sup>

SOURC

**PROCESS** 

Planting and fishing are combined 23.56km<sup>2</sup>

(o)

Ecological pond

124ponds

# Step 2 TRANSMISSION PROCESS PURIFICATION

Ecological ponds and ecological canals are the first hurdle in the management of surface pollution, which can greatly reduce the nitrogen and phosphorus content of pollution.

Ecological ditch

246.37km

AA

Ecological buffer

0.06km<sup>2</sup>

# Step 3 ARTIFICIAL WETLAND PURIFICATION

The last interception barrier, mainly through the plants, microorganisms and soil matrix in the wetland to further purify the pollutants in the water.

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Submerged vertical wetland

 $0.55km^2$ 

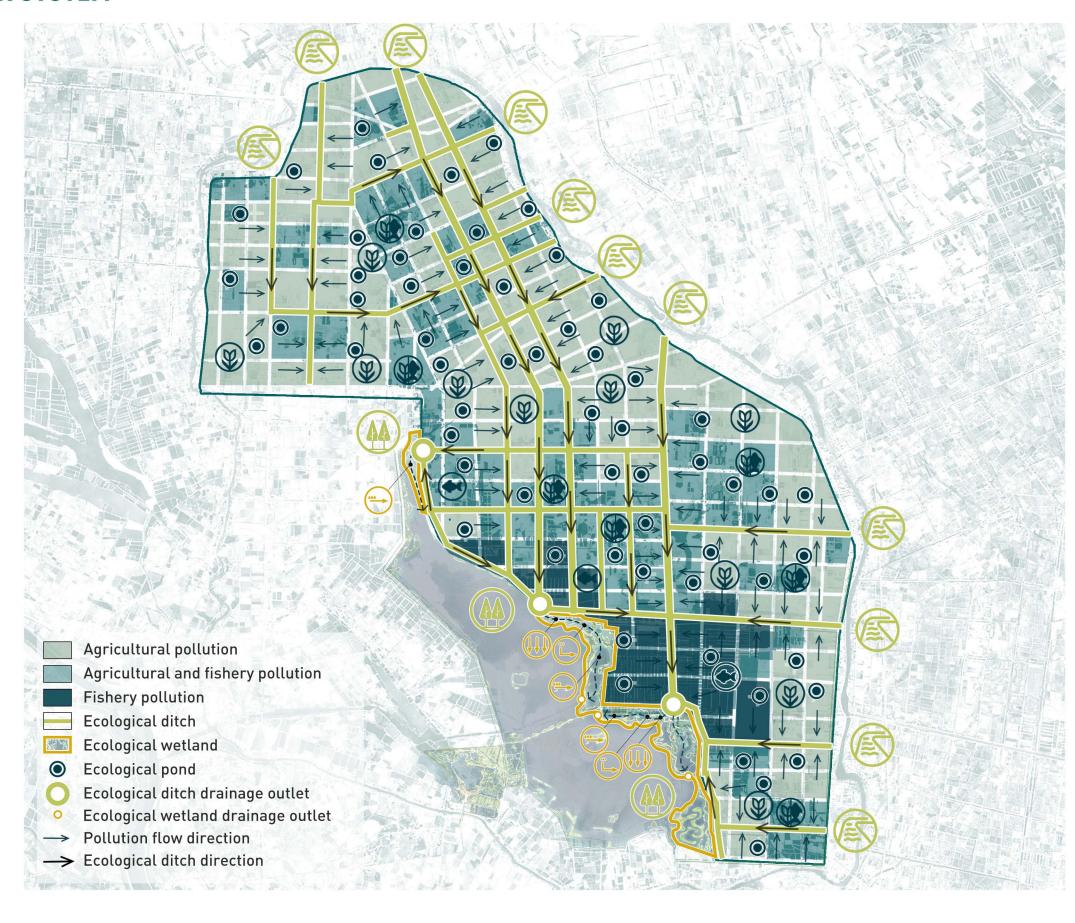
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Submerged horizontal wetland

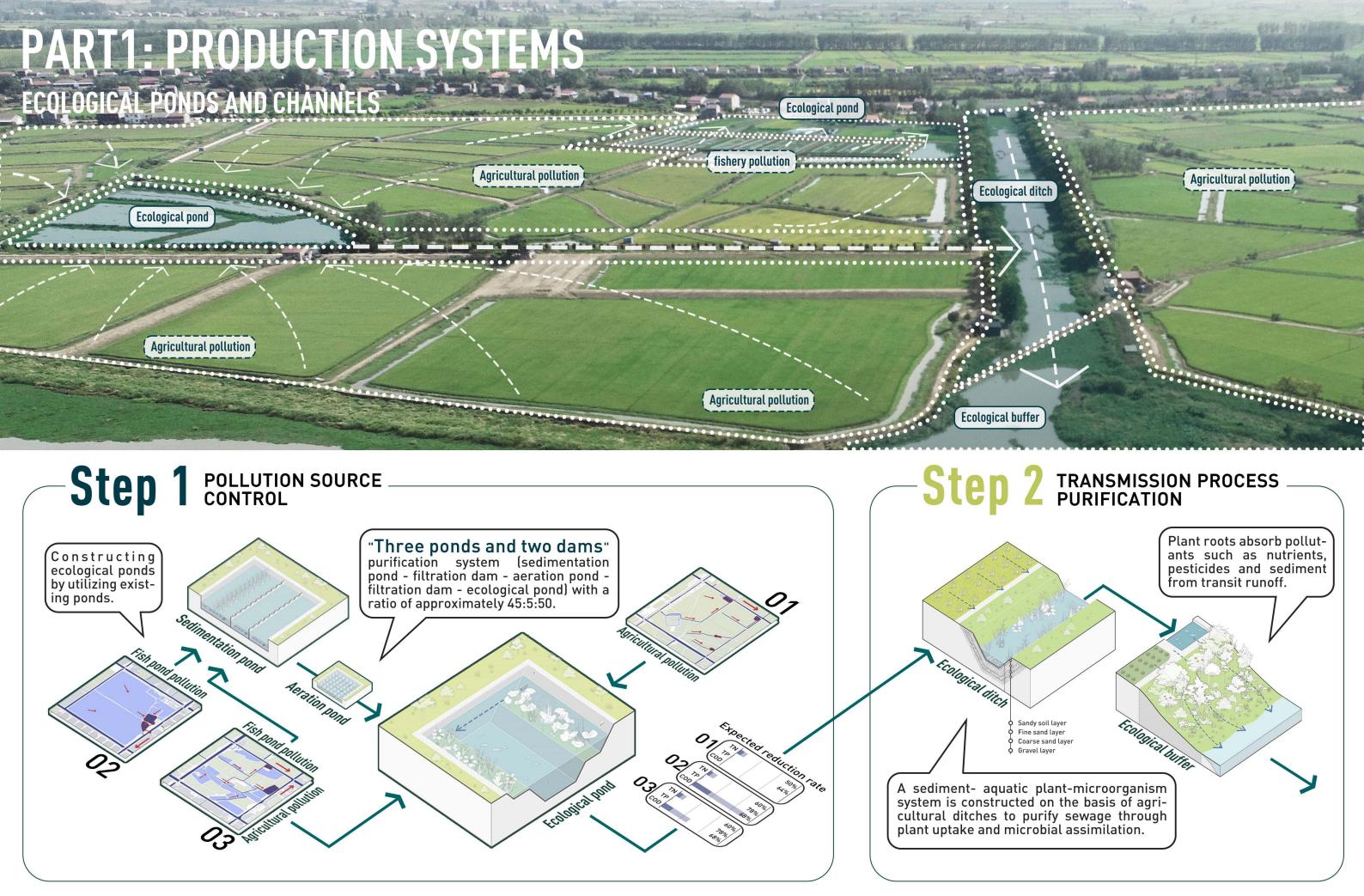
0.47km<sup>2</sup>

Surface flow wetland

1.04km<sup>2</sup>

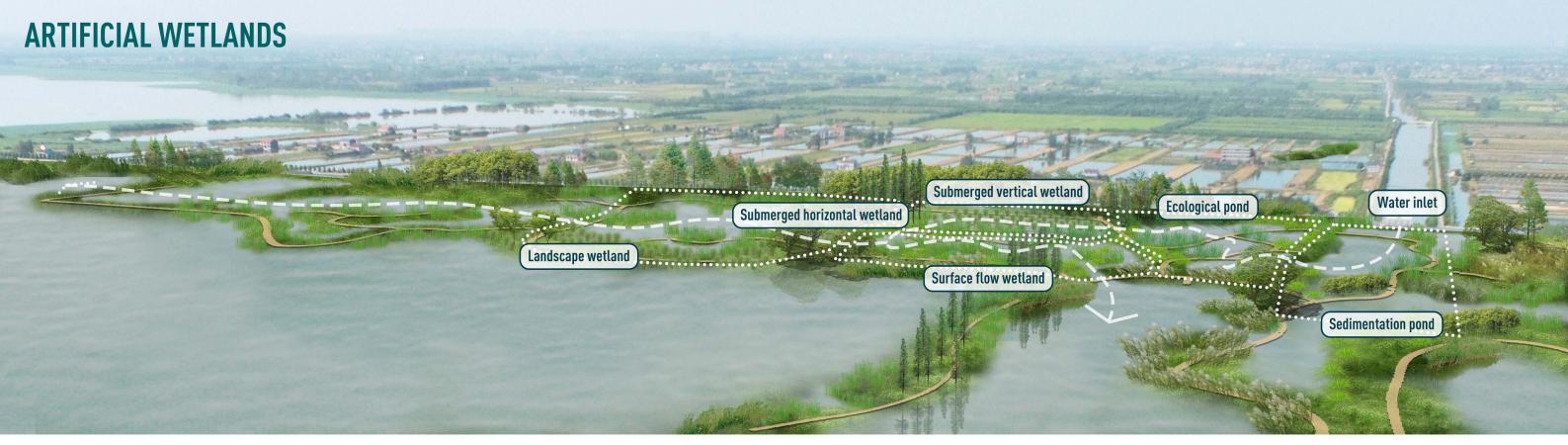


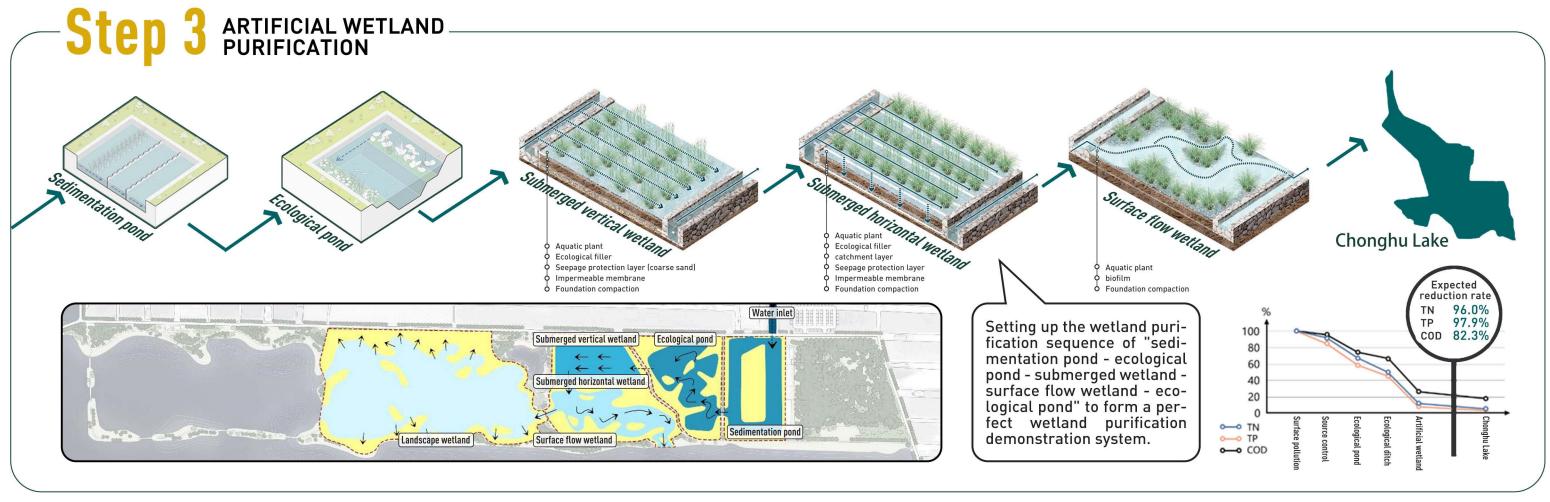
The project has established a pond-channel wetland complex system, characterized by ponds as points and channels as lines. This system comprises three main components, which effectively enables the resource utilization and harmless treatment of pollutants generated by agricultural production.



Ecological ponds in farmland are set up to guide the collection, sedimentation, and preliminary filtration of non-point source pollutants, while the reduced use of chemical fertilizers is encouraged. Ecological channels receive wastewater from the ecological ponds, where plants filter out nitrogen and phosphorus to reduce water pollution.

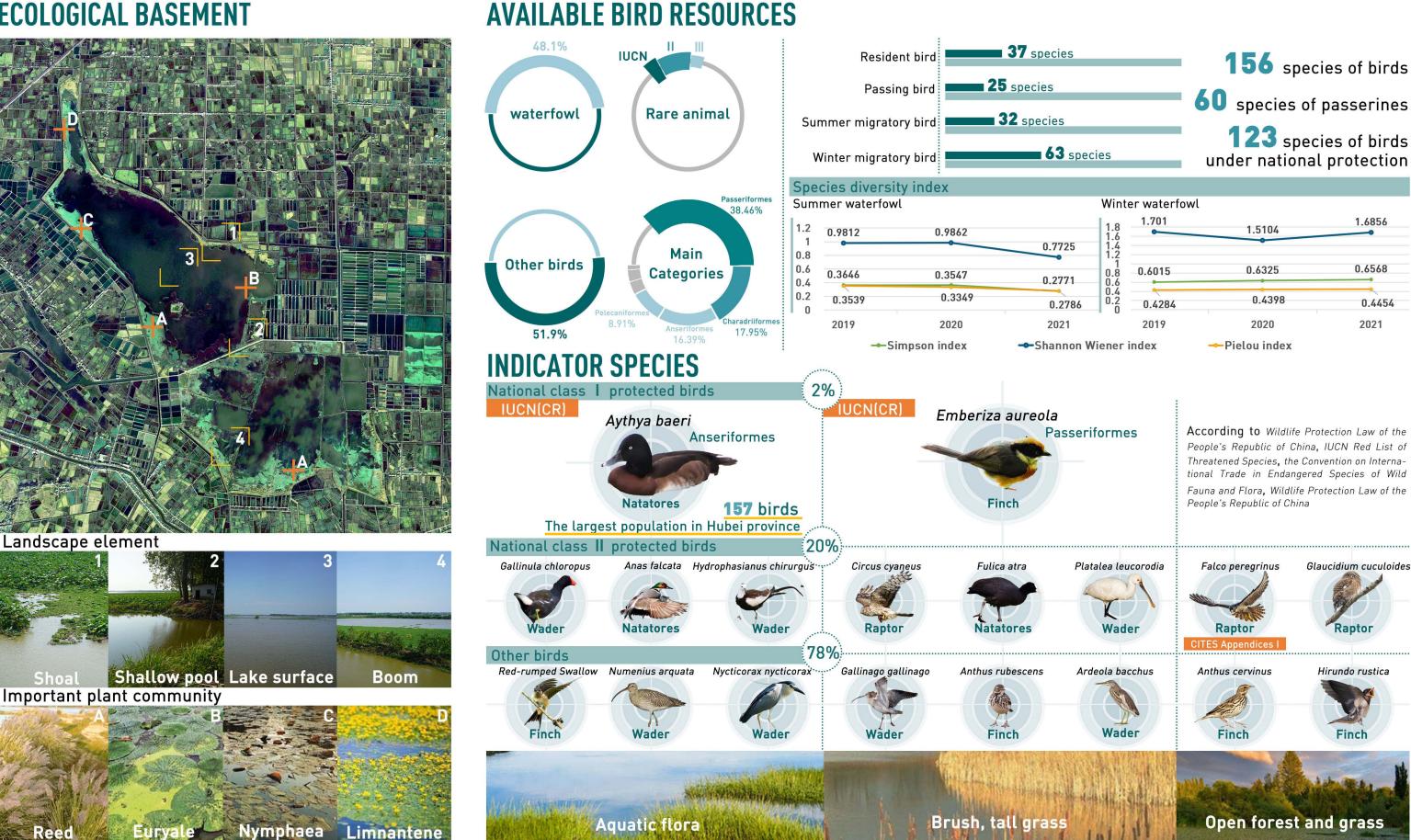
# **PART1: PRODUCTION SYSTEMS**





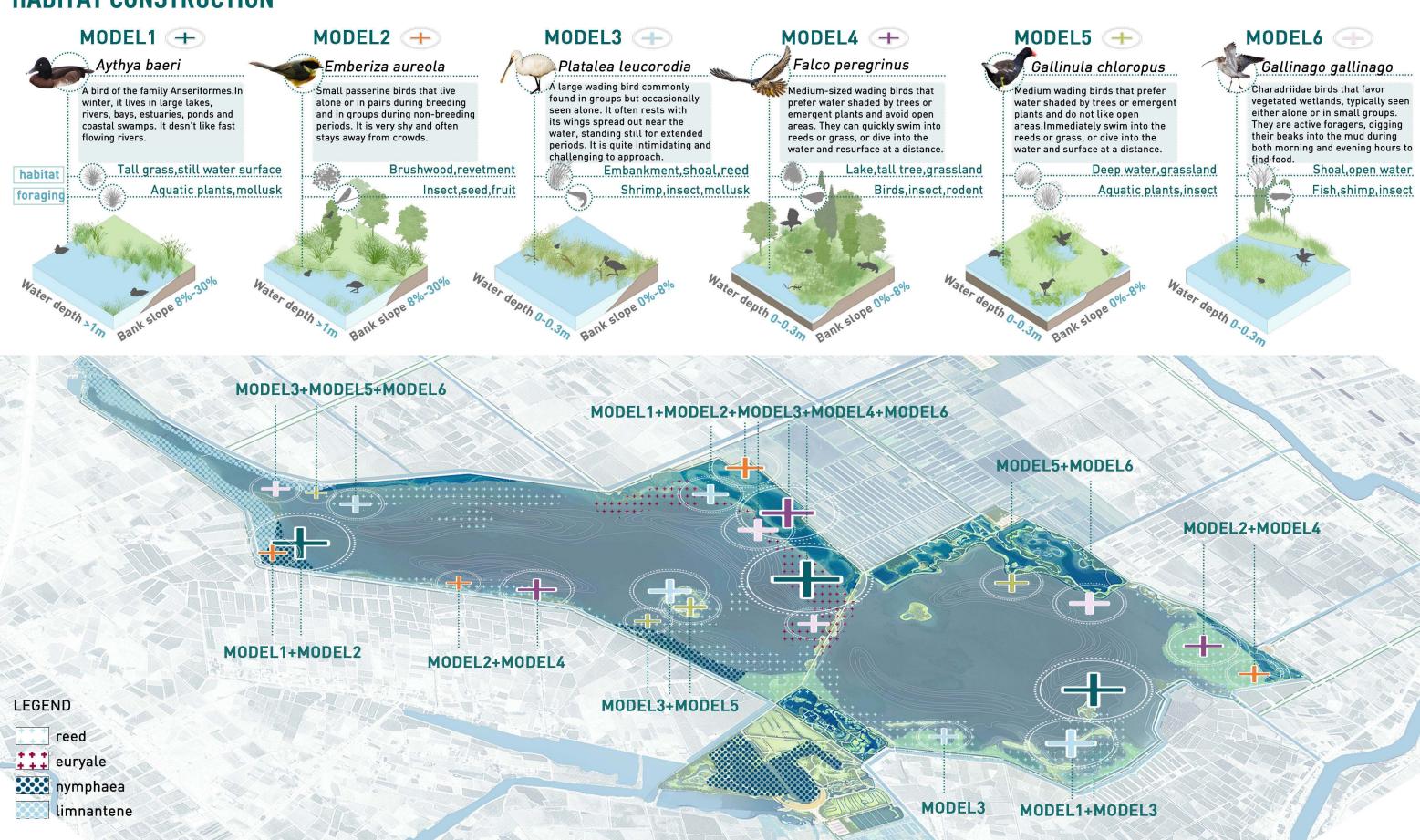
Artificial wetlands serve as the final interception barrier. Plants, microorganisms, and soil substrates in the Artificial wetlands further purify the pollutants. This complex system promotes the growth of green plants through the recycling of nutrients and water, achieving the resourceful and harmless treatment of pollutants.

### **ECOLOGICAL BASEMENT**



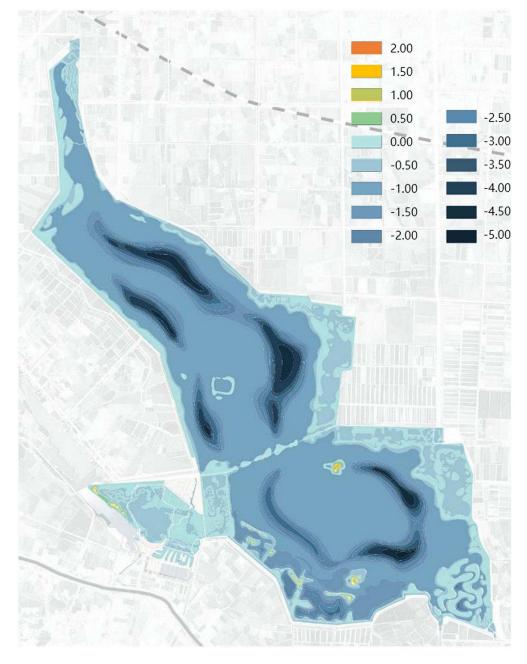
In collaboration with bird experts, wetland specialists, and the government, the project identified the current habitat conditions and biological resources of Chonghu Wetland. Several key protected birds, identified according to the IUCN Red List and national protection classes, serve as indicators of the wetland's habitat quality.

### **HABITAT CONSTRUCTION**



The project reshaped six different wetland habitat models to meet the needs of six key protected birds, including Aythya baeri, Emberiza aureola, Platalea leucorodia, Falco peregrinus, Gallinula chloropus, and Gallinago gallinago. These habitat models feature varying vegetation types and water depth variations.

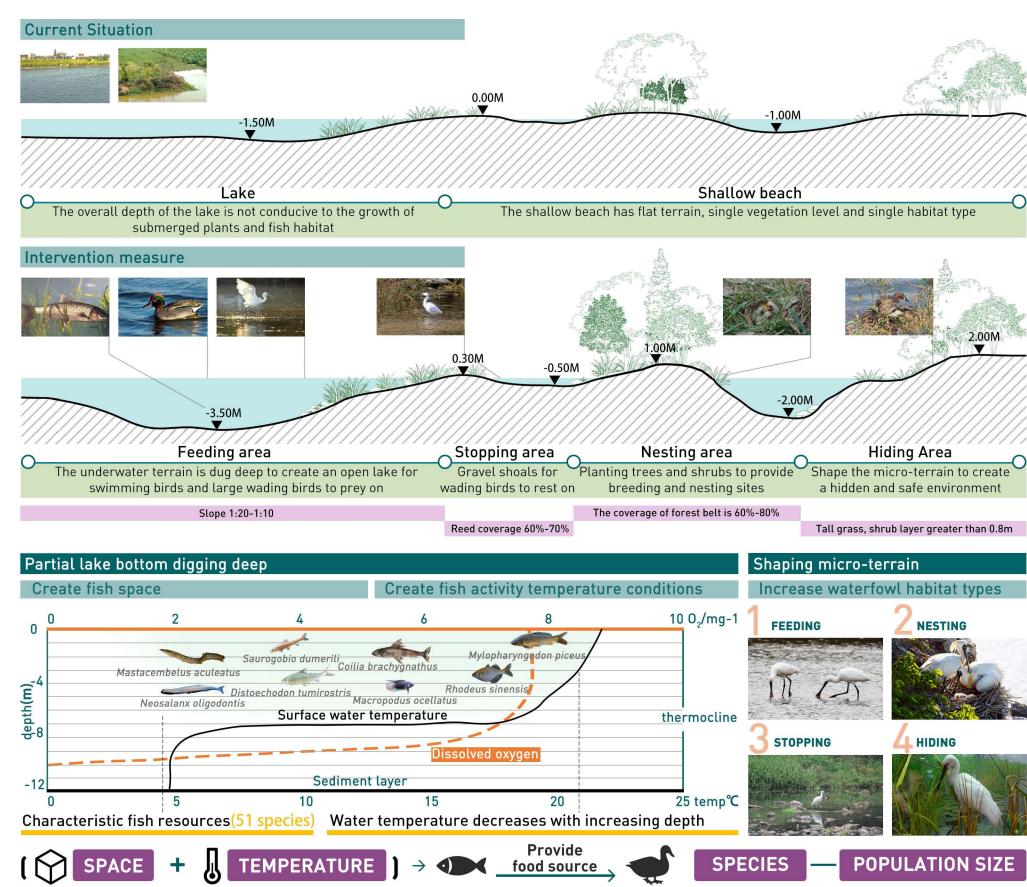
### **RESHAPING OF LAKE DEPTH**



The deep excavation area surrounds the North and South Lakes, forming a coherent and changing terrain and promoting the dynamic connectivity of wetland hydrology.

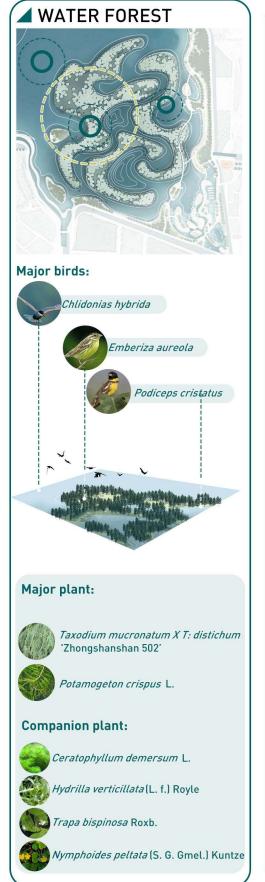
AVERAGE  $1.5M \rightarrow 2-2.5M$ DEEPEST  $3.5M \rightarrow 5M$ 

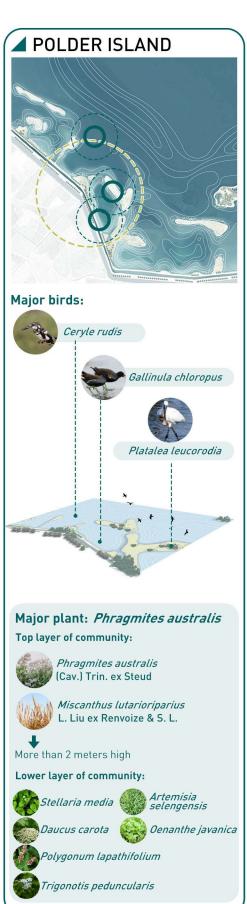
The use of dredged silt at the bottom of the lake to stack the island provides a more suitable habitat. The excavation volume is 3.4 million m³, and the total amount of fill is equivalent to the excavation.



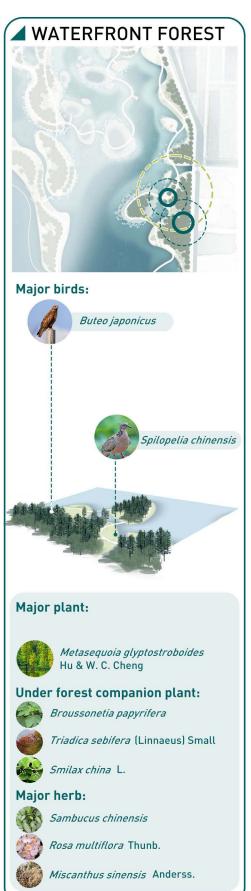
The project altered the lake's depth and reshaped the terrain to provide suitable habitats for various fish and other small aquatic animals. Additionally, the different water levels and vegetation types cater to the diverse needs of birds for resting, short stays, and long-term habitation.

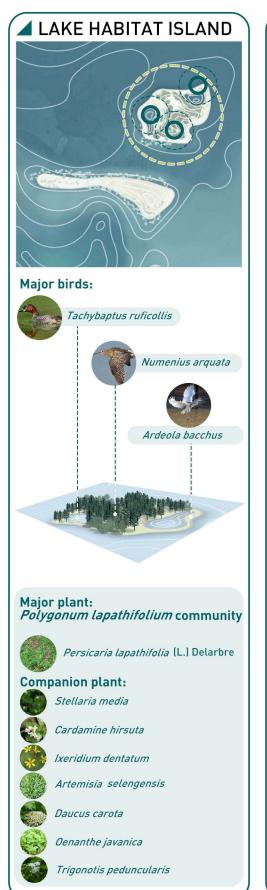
#### **NODE DESIGN**





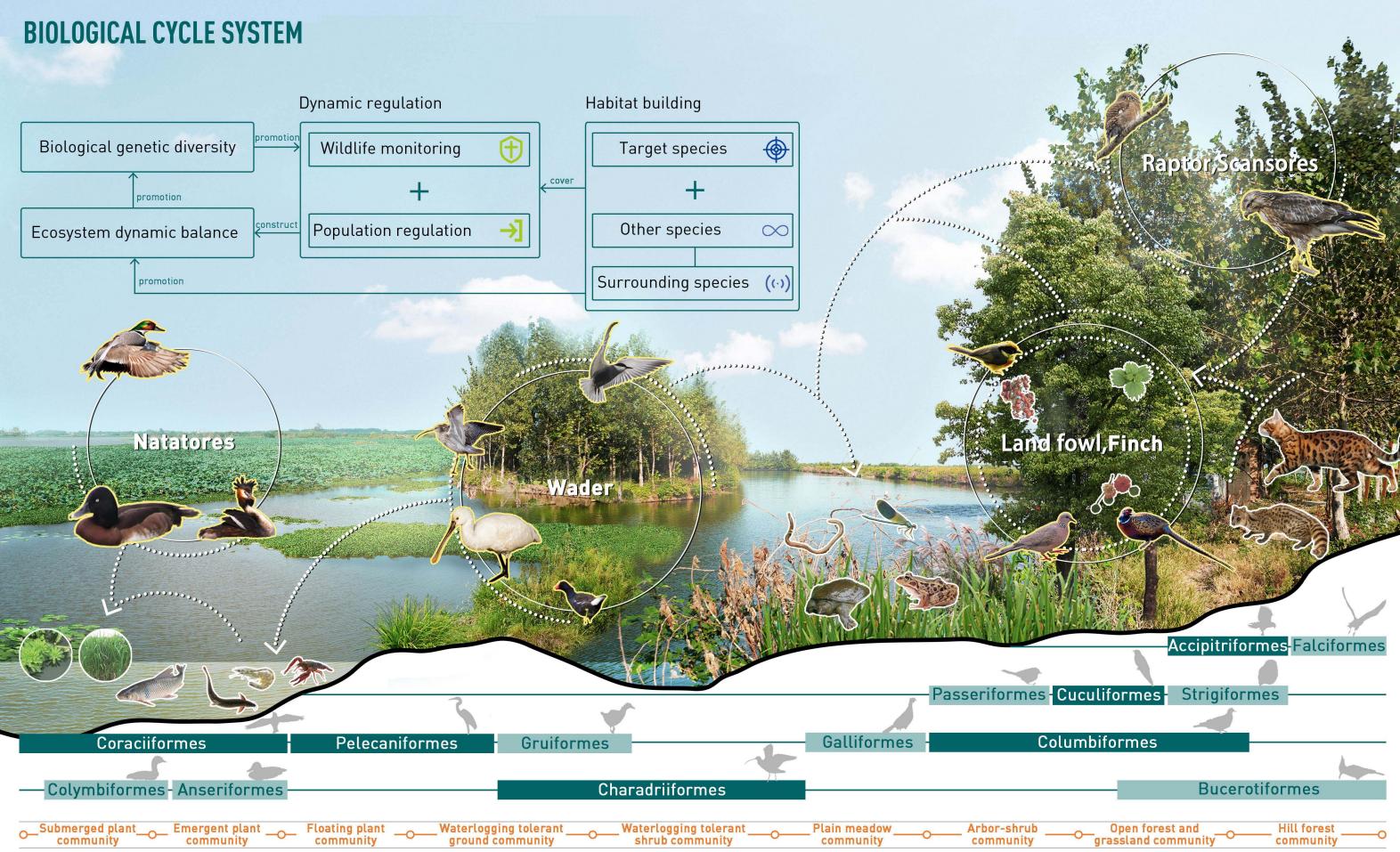








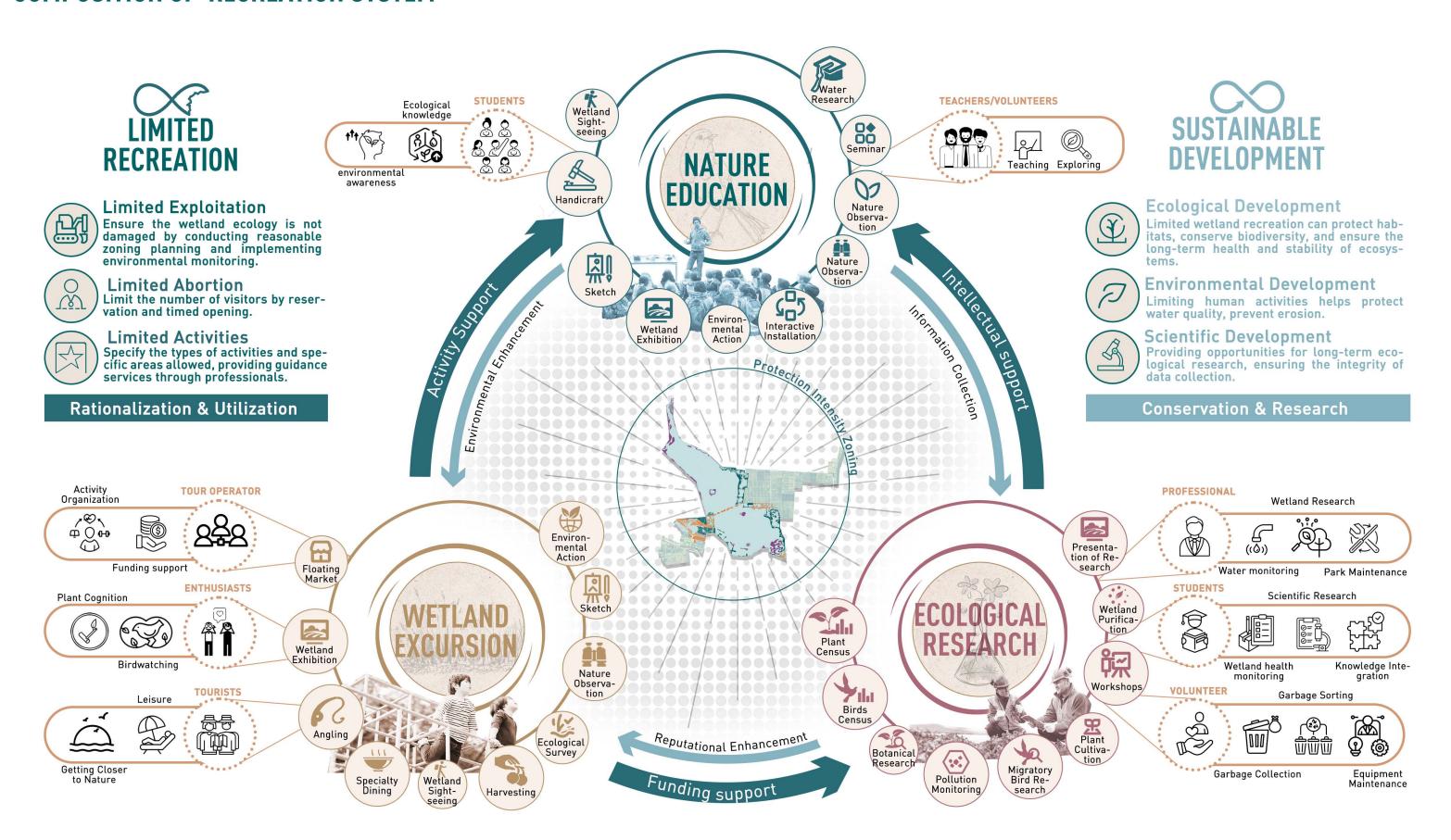
The project showcased six typical combined habitats, including water forest, polder island, ecological pool, waterfront forest, lake habitat island and tidal flat wetland. These habitats feature three different plant communities: shrubs, grasses, and woodlands, to accommodate the preferences of various bird species.



Appropriate plants and suitable small aquatic animals provide material resources for bird habitats and attract other wildlife in the surrounding area, gradually establishing a dynamic balance in the wetland's biological cycle system. With habitat optimization, a notable increase in species diversity is expected to occur soon.

## **PART3: RECREATION SYSTEM**

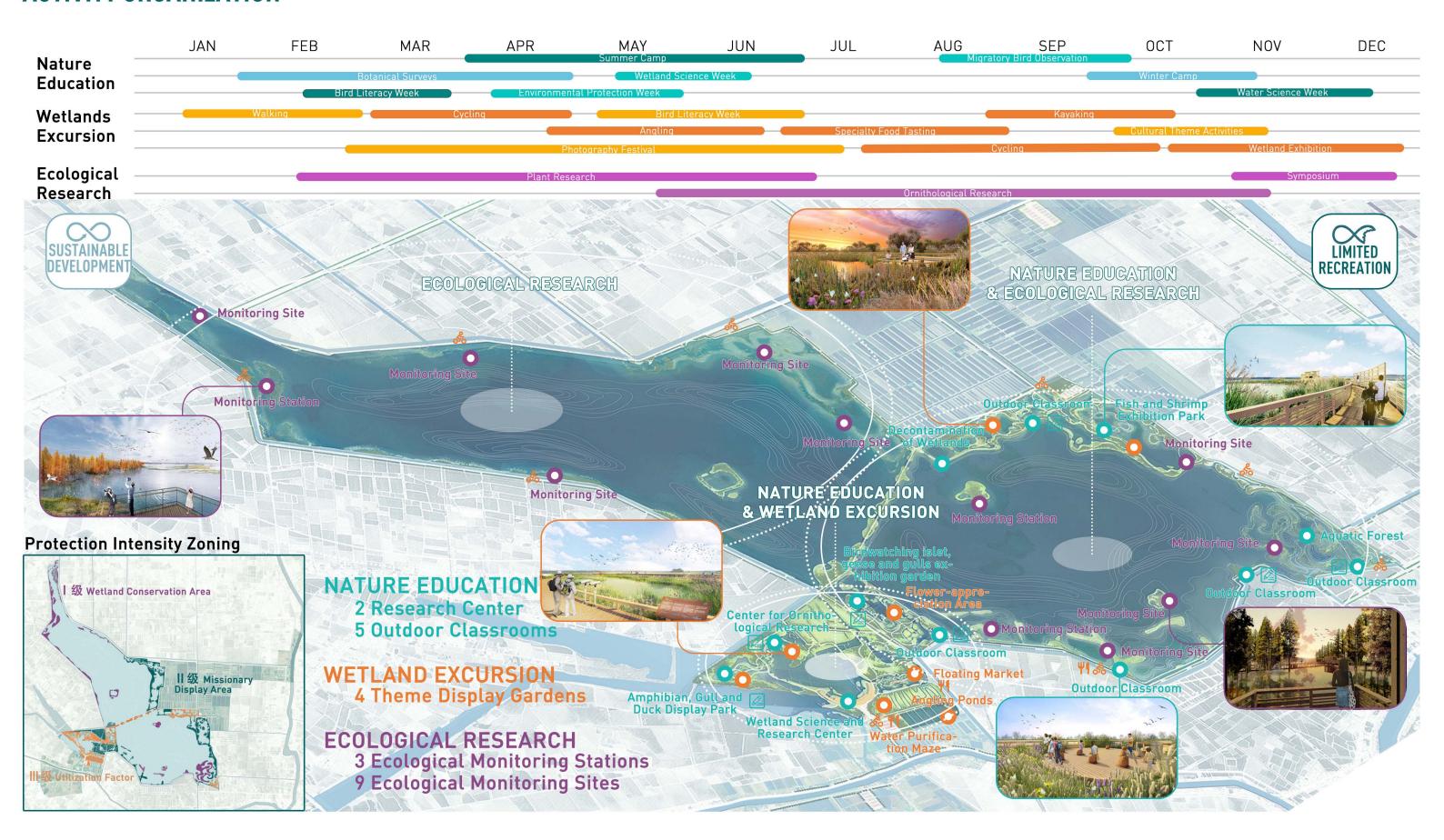
#### **COMPOSITION OF RECREATION SYSTEM**



The project advocates for a limited recreational model to support the sustainable development of the wetland. At the same time, it has established a recreation system consist of nature education, wetland excursions, and ecological research, providing the public with a platform to engage with nature.

### **PART3: RECREATION SYSTEM**

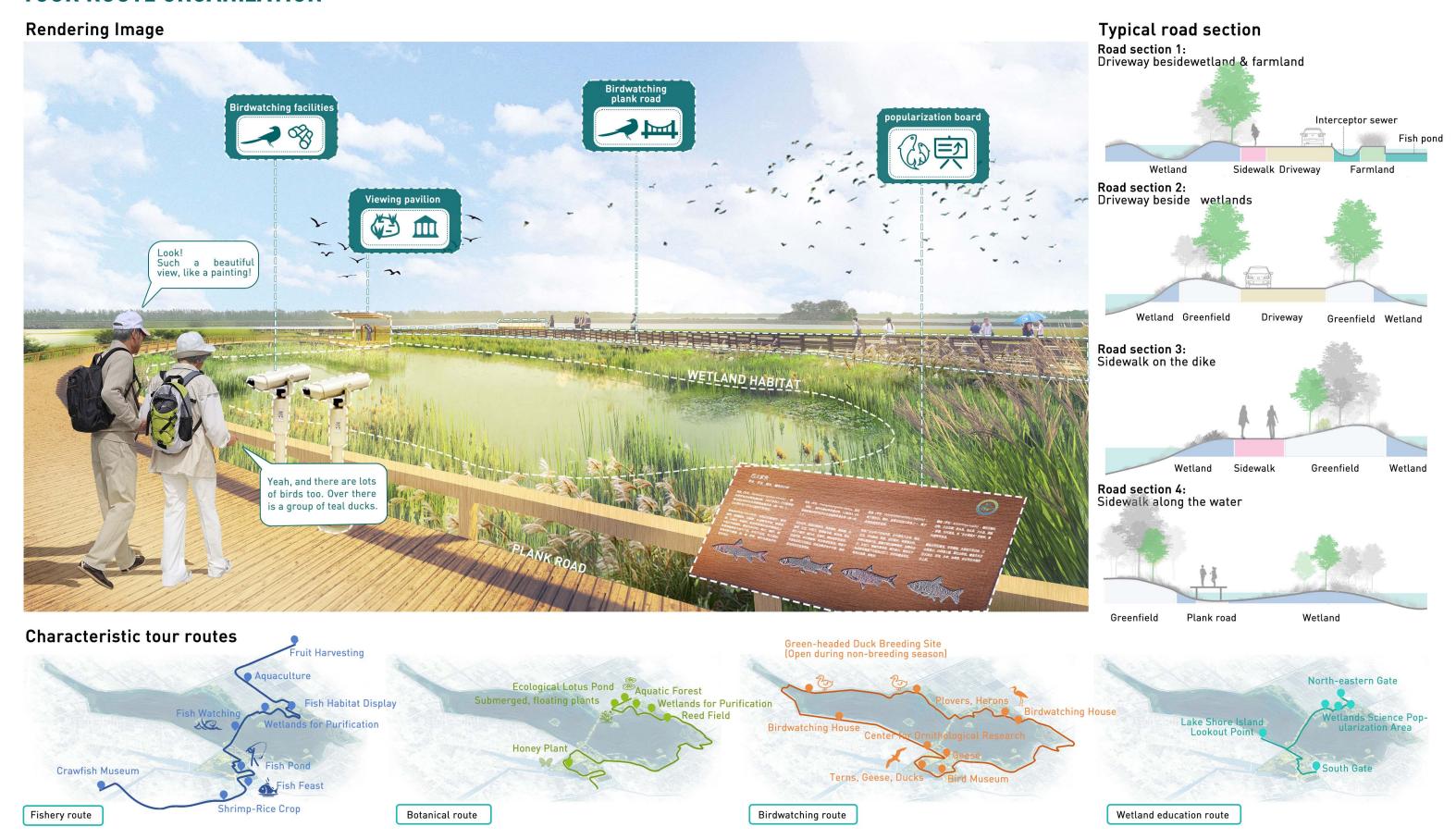
### **ACTIVITY ORGANIZATION**



The project plans knowledge lectures, art exhibitions, and other activities based on different seasons. It also establishes bird and fish display gardens to help the public learn about the wetlands. By setting up monitoring stations and research centers, the project lays a solid foundation for wetland management and maintenance.

# **PART3: RECREATION SYSTEM**

### **TOUR ROUTE ORGANIZATION**



The project plans four themed routes: fishery route, botanical route, birdwatching route, and wetland education route, providing opportunities for visitors and local residents to relax, unwind, and connect with nature.



The project has planned a modern agricultural cluster around Chonghu Lake. On one hand, each village leverages its unique agricultural resources to develop distinct rural industrial models. On the other hand, Chonghu National Wetland Park continuously brings in tourist resources due to its excellent wetland resources.

# **PROJECT SUMMARY**



This project addresses comprehensive wetland management and agricultural optimization in the face of climate change and agricultural industrialization. It also integrates the development of the park and its surrounding areas, injecting new vitality into regional economic and social development.