

## Thinking of Wetland Reconstruction and Ecological Remediation for Shallow Lakes

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In the Taihu Lake Basin, river system is well-developed and shallow lakes are dotted extensively. But the shallow lakes ecosystem function is degenerating, aquatic biodiversity is declining, the ability for purifying and intercepting pollutants is severely degrading. Due to the lakes characteristics of low-polluting water treatment capacity and favorable ecological environment for implementing all kinds of ecological remediation technology, the overall idea with ecological treatment for in-flow and out-flow rivers estuary, ecological remediation along the lakeside, restoration and stability of aquatic ecosystems as the main direction on the wetland reconstruction and ecological remediation in Taihu lake basin was put forward. A case study was conducted of the Gehu Lake which is a complicated and typical lake that linked to river in the headwater area of Taihu Lake Basin. It will provide a scientific basis for the ecological restoration and reconstruction of shallow lakes.

In the Taihu Lake Basin, river system is well-developed and shallow lakes are dotted extensively, with area of over 1300 km<sup>2</sup> (excluding Taihu Lake). The area of 189 lakes is over 0.5 km<sup>2</sup>, and that of 6 lakes is over 40 km<sup>2</sup>. Shallow lakes are an important part of the ecosystem and the center for protection of water source and ecological restoration of Taihu Basin, which plays an important role for interception and water purification and also the key node joining the river - lake system.

The restoration of aquatic ecosystems means recovering the aquatic degenerated ecosystems to their original levels through a series of measures, which could make the aquatic ecosystems get higher ecological tolerance [1]. JIN [2] put forward the overall idea about lake water pollution control with pollution source management system, improving the ecological system of lake water and river basin management as the main direction. Improving the ecological system refers the lakes with the declining or degenerating tendency of water quality or water ecology turn into the healthy aquatic ecosystems through lakeside ecological remediation and the restoration of aquatic ecosystems step by step, and achieve virtuous circle of aquatic ecosystems. LIU [3] presents the main contents about the restoration of lake ecological system, practice from both domestic and abroad and the advices of co relational studies. QIN [4] clarified the ways to the lake aquatic plant restoration and ecosystem restoration in theory, base on the basic concepts of the restoration of Lake Ecosystem and the relation analysis.

Due to the shallow lake characteristics of low-polluting water treatment capacity and favorable ecological environment for implementing all kinds of ecological remediation technology, this paper presents an idea on the wetland reconstruction and ecological remediation in Taihu Lake. A case study was also conducted of the Gehu Lake which is a complicated and typical lake that linked to river in the headwater area of Taihu Lake Basin. An ecological remediation program was put forth for Gehu Lake. The focus of program includes the follows strategies: purification of low pollution water at in-flow river estuary, ecological interception of pollutants at out-flow river estuary, plant restoration and wetland reconstruction at shallow area, regulating the lake ecosystem to maintain stability. It will provide technical supports and scientific basis for ecological remediation and repair reconstruct of shallow lake in a wide range of areas.

### General Idea of Wetland Reconstruction and Ecological Remediation for Shallow Lakes

The cause and main influencing factors of ecological damage are diagnosed, considering the natural characteristics and water quality, aquatic ecological situation. General idea is suggested based on the lakes characteristics of low-polluting water treatment capacity, favorable ecological environment conditions are made the best use of, such as shallow lakes characteristics of vast water bodies, strong eco-regulating capability, and compatible with the implementation of ecological restoration integrated technology, in order to realize wetland restoration and ecological security for shallow lakes. In short, the way is "in-flow and out-flow rivers estuary, ecological remediation along the lakeside, restoration and stability of aquatic ecosystems" to carry out shallow wetland reconstruction and ecological remediation, according to the principle of "Classification, Zoning, Grading, Staging" (Figure 1).

### Program of the Wetland Reconstruction and Ecological Remediation for Gehu Lake

Gehu Lake is part of the Taoge water system in the upstream of the Taihu Lake. It is a shallow lake with typically complicated drainage system that lakes and rivers connect with each other [5]. It is with such ecological service function as water storage, water purification and intercepting sedimentation pollutants. In recent years, water environment quality of Gehu Lake has declined significantly. It is also a truth that eutrophication process of water environment has been accelerating, ecosystem function degrading and aquatic biodiversity declining [6]. The lake has degenerated from a clear water lake into a muddy algae lake. Gehu Lake has lost the function of regulating and purifying the water flows into Taihu Lake coming from the upstream region to the west of the lake.

### Diagnose the Cause and Driving Factors of the Ecological Damage for Shallow Lake

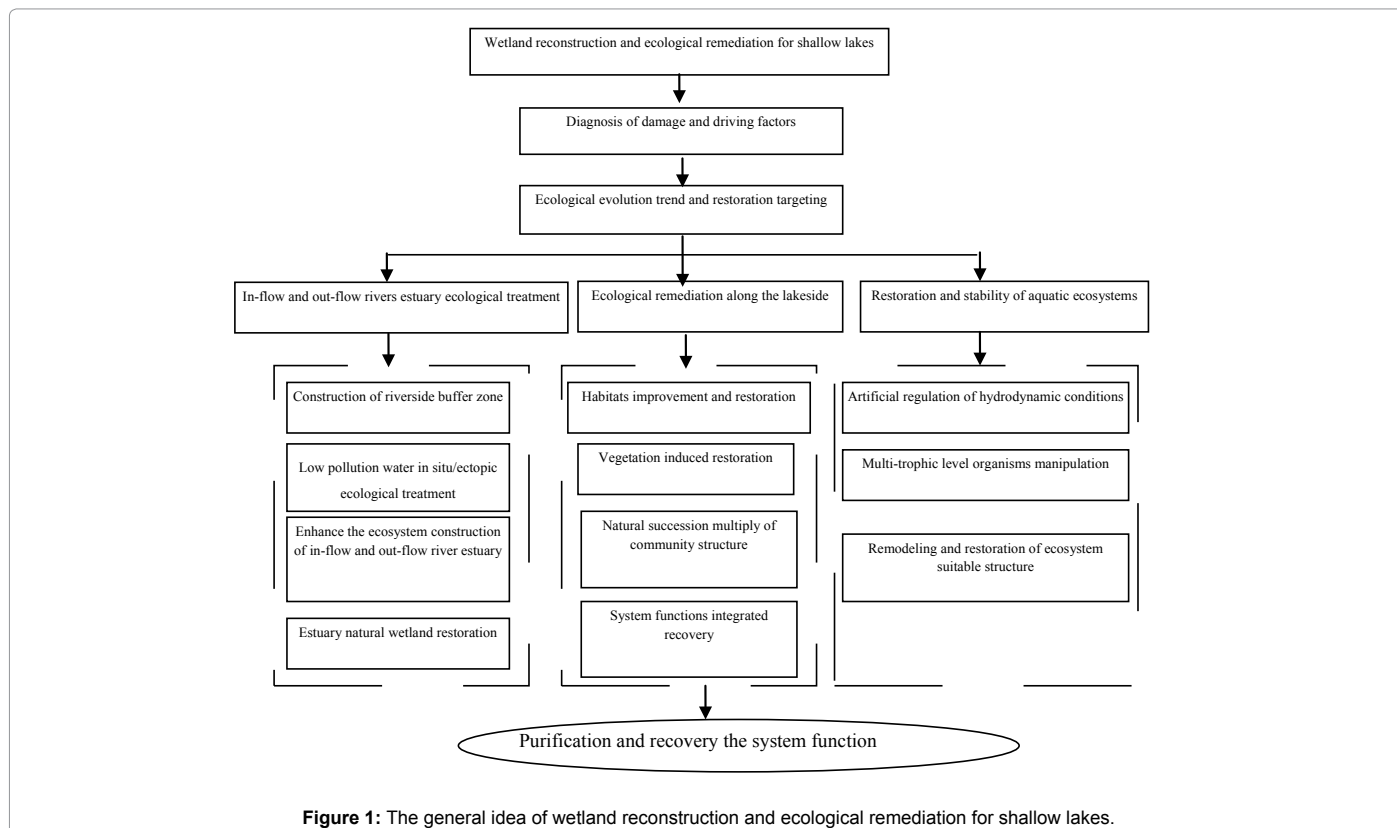
Investigation is carried out on water quantity, water quality, aquatic organisms situation, and related to human activities, basic situation investigation and historical data collection of shallow lake wetlands in the whole basin. Environmental problems of the shallow lake situation are identified. The various environmental factors of shallow lake wetland and the correlation with human activities (including pollution load into the lake, fish farming scale, sediment characteristics, lake water quality etc), are analyzed during the same period, in order to figure out the

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mechanism and capacity of purifying pollutants for the shallow lake wetlands, to make sure the shallow lake ecological degradation causes and key factors. So that, Damage causes and main factors of the shallow lake ecosystem are clarified.

### Trend Prediction and Remediation Goal Confirmation for Shallow Lakes and Wetland Ecosystem

Variation tendency of shallow lake ecosystem and confirmation of remediation goal was precisely analyzed and estimated on the basis of status evaluation on shallow lake ecosystem and identification of the key factors in ecological degradation, so as to provide theoretical basis and guidance for the whole scheme compiling of ecological restoration.

### Reconstruction and Ecological Restoration of Shallow Lake

- i) Ecological engineering out /into Gehu Lake.
- ii) Ecological restoration engineering along Gehu Lake.
- iii) Ecological engineering for aquatic ecosystem restoration and stability maintenance construction.

It can be used to reduce shallow lake wetland's reclamation or deposition and to prevent the lakes to shrink by doing the restoration and reconstruction for it, which can also provide for growth habits for different plants and rich food chains for the animals to maintain the ecological diversity of the lake. On the basis of the removal of stress factors previously, it can creates habitat conditions for ecosystem restoration to strengthen and broaden the ecological corridors of the main nutrient transport and transformation in the water system by the hydrodynamic conditions through artificial regulation and multi-trophic level biological manipulation and other artificial means of intervention. Subsequently the remodeling and repair for the

ecosystem suitable structure can promote its self-organization process and accelerate the evolution of water system to be a stable mature ecosystem.

General ideas are presented in this paper for the ecological restoration and reconstruction of shallow lakes. It will provide technical supports and scientific basis for ecological remediation and repair reconstruct of shallow lake in a wide range of areas. There are problems to be further studied about the parameters of ecological restoration in large scales, the recovery of submerged plant under the stress of many various factors, and natural rehabilitation and evolution of the integrated ecosystem.

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