

WETLAND RESOURCE PROTECTION AND RATIONAL UTILIZATION IN CHINA

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ABSTRACT: Wetlands of China cover an area of 63 million ha, among which, natural wetlands 25 million ha, including mires, shallow lakes, etc., artificial wetlands 38 million ha. Besides these, there are a lot of rivers and islands, stretching 18,000 km of coastal line and coastal zone below the tidal within the water depth of 6 m. Based on the climatic regional differences, biota similarity and biodiversity abundance, China's wetlands can be divided into 9 main regions. Wetlands not only have huge functions to regulate mankind's living environment, but also are the important and precious natural resources. For a long period, since the contradiction between population and resources, energy, grain is getting more and more obvious, China's wetlands are facing to serious disturbances, such as large-scale reclamation, over-hunting, industrial waste water pollution and species introducing. They have brought about the wetland quantity reducing and quality falling, furthermore have effects on sustainable development. For the special national conditions of China, higher population pressure, China should carry out wetland resource protection and rational utilization, not only protection.

KEY WORDS: wetland resource, wetland utilization, wetland protection, China's wetlands

Wetlands are special ecosystems found at the interface between terrestrial ecosystems and aquatic ecosystems and has some characters of these two ecosystems. At present there are many wetland definitions, general speaking these definitions can be divided into 2 categories, one is the definition that scientists defined for the researching purpose; the other definition for the purpose of management. Although there are a lot of definitions of wetlands, we think that environment with much water (stagnant water or over wet), unique soils(hydric soils) and biologic activities adapted to water environment are the basic characters of wetlands.

I. REGIONAL DISTRIBUTION OF WETLANDS IN CHINA

Based on present statistic data, wetlands of China cover an area of 63 million ha, among which natural wetlands 25 million ha, including mires, shallow lakes, etc, artificial wetlands 38 million ha. Besides these, there are a lot of rivers, among these rivers there are 50,000 rivers whose drainage area is above 10,000 ha. There are also more than 5,000 islands, coastal line stretching 18,000 km and coastal zone below the tidal within the water depth of 6 m^[1]. A lot of wetlands hold important place in the world. (Fig. 1).

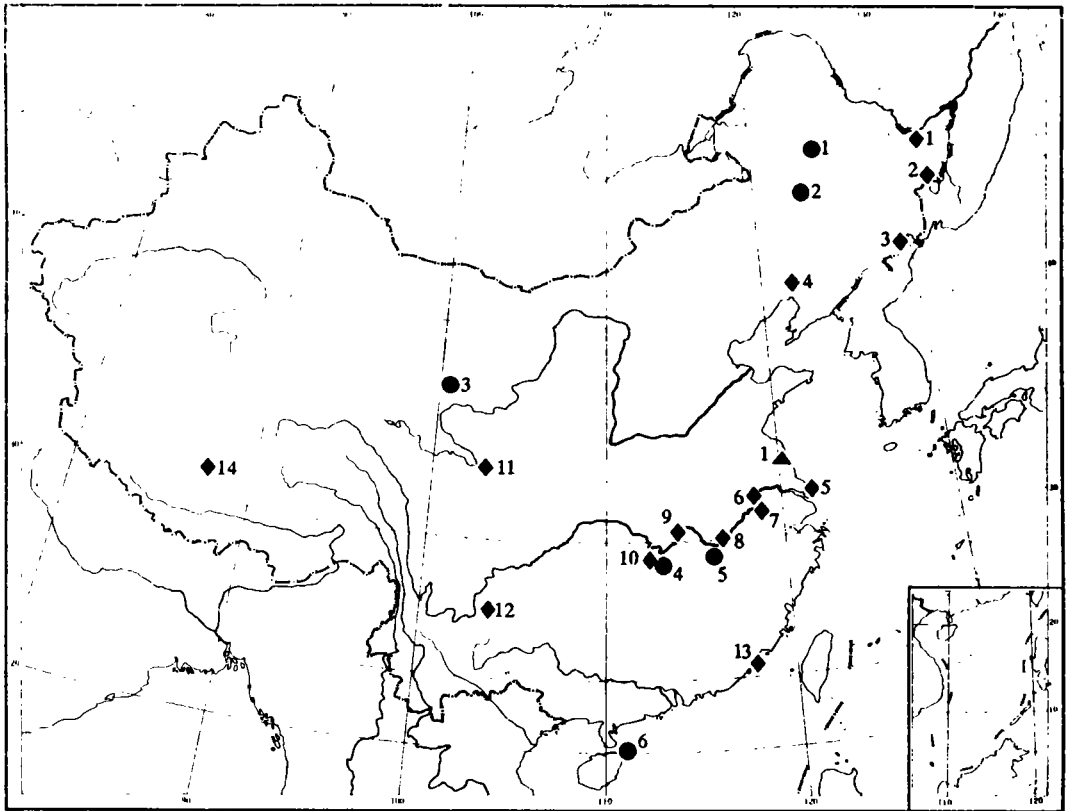


Fig.1 Wetlands of international importance in China

● Ramsar Sites:

1. Zhalong 2. Xiaohai 3. Birds Island 4. East Dongting Lake 5. Poyang Lake 6. Dongzhaigang

▲ Biosphere Reserves of Wetland Importance:

1. Yancheng

◆ Other Important Wetland Sites:

1. Sanjiang Plain 2. Xingkai Lake 3. Tumen flood-plain 4. Shuangtaizi and Liaohe River mouth 5. Chongming Island
6. Gucheng Lake 7. Chinese Alligator Nature Reserve 8. Shengjin Lake and lake groups in the lower Changjiang River
9. Lakes around Wuhan
10. Dongting Lake 11. Zoige marsh 12. Caohai Nature Reserve 13. Jiulong River mouth 14. Lakes of the Qinghai-Xizang Plateau

Based on the climatic regional differences, biota similarity and biodiversity abundance, China's wetlands can be divided into 9 main regions.

1. Wetlands in Northeast of China. The biggest fresh-water mire in China lies in Northeast of China, including Heilongjiang Province, Jilin Province, Liaoning Province and northeast of Inner Mongolian Autonomous Region, the total area is 7.5 million ha, of which the Sanjiang Plain is the biggest marsh in China.

2. Wetlands in Inner Mongolia Gobi Desert. Some large-scale salt lakes and salt marsh wetlands are distributed in the inland dry drainage at the south of Inner Mongolia Big Gobi Desert. They include Dalai Lake and Anguli Lake, which are the important breeding area of migratory waterfowls

3. Wetlands in the Huanghe (Yellow) River and the mid-and-lower reaches of the Changjiang (Yangtze) River. This region is the most concentrational distribution area of fresh-water lakes in China, including Dongting Lake, Poyang Lake, Chaohu Lake, Taihu Lake and Hongze Lake. The total area of these lakes is 2.2 million ha. These wetlands are the main aquatic products area in China. In 1992, Poyang Lake, East Dongting Lake were listed in international important wetland list.

4. Coastal Wetlands to the North of Hangzhou Bay. Wetlands are mainly clay-accumulated coastal beach except for Liaoning Province and Shandong Peninsula which are rock coastal beach. Coastal marsh and foreshore in China, with about 2.1 million ha, are mainly distributed in this region. They are mainly 3 regions as follows: the Changjiang River estuary and coastal beach wetlands in Jiangsu Province, Bohai Bay and the area around Huanghe River mouth, and the Liaohe River and Hunhe River mouths. The area of estuary delta increases quickly as a result of silting of clay and sand, new wetlands form continuously in this region.

5. Coastal Beach Wetlands at the South of Hangzhou Bay. Wetlands in this region are mainly rock coastal beach. Unique mangrove marshes are distributed at the clay-silting coastal beach of the bay and estuary. The total area of mangrove is about 6,000 – 7,000 ha. This region is also the fish production area.

6. Wetlands in the Yunnan-Guizhou Plateau. In mountain areas in Yunnan Province, Guizhou Province, Sichuan Province (the Southwest of China), there are some sparse wetlands, including Caohai in Guizhou, Dianchi Lake in Kunming, Erhai at Xiaguan and a series of discontinuous lakes and marshes at upstream of the Changjiang River and the drainage of Lancang River.

7. Wetlands in Xinjiang Desert. This region includes some large-scale salt lakes such as Bosten Lake and Ruoqiang Lake in Tarim, Aiding Lake in Turpan Basin and Manas Lake in Junggar Basin, and salt marshes around.

8. Wetlands in the Tianshan Mountains and the Altay Mountains. The wetlands include some large lakes in the Tianshan Mountains and the Altay Mountains

upland and a series of small lakes.

9. Wetlands in the Qinghai-Xizang (Tibet) Plateau. Wetland here is a unique wetland owed by our country. Its altitude is between 3,000 m and 5,500 m, north to the Kunlun Mountains and the Nanshan Mountains, south to the Himalayas, innumerable lakes and mires are distributed there sparsely. They are the sources of the several biggest rivers in the world. This region includes Qinghai Lake (458,000 ha), Nam Lake, Yamzho Lake, etc., and also Zoige marsh of west Sichuan Province with an area of 300,000 ha.

II. WETLAND VALUE

The wetland is thought as “kidney” of the earth, it not only has huge functions to regulate mankind’s living environment, but also is the important and precious natural resource.

1. Important Land Resource

Soils of wetlands contain high humus and sufficient or surplus water, they supply rich nutrition elements and good environments to growth and reproduction of microbes and vegetation. Paddy-field as important artificial wetland is an important land resource. According to water supply kinds, paddy-field can be divided into 3 categories: depressional paddy-field and plain paddy-field fed by ground water, hilly paddy-field fed by surface water and soaking paddy-field with soaking water supply, with an area of about 3.8 million ha, further more the paddy-field in the north of China is developing continuously, so its area is increasing. Paddy-field occupies 1/4 of arable land area, but rice output makes up 2/5 of the total grain output. So paddy-field, as a land resource, plays an important role in the grain supplies of our country. Besides, some other wetlands can sustainably supply raw materials, such as reed, wood and other plant products, to mankind, these raw materials have been extensively used in agriculture, energy resource, medicine and environment protection, etc.

2. Important Water Resource

Wetland means depressional land which is covered by permanent or seasonal discontinuous stagnant water. Water is one of the basic characters of wetland. Wetland, as an important water resource, mainly including river, lake, marsh, coastal zone, river mouth, ground water, supplies drinking water and some other water. According to the estimation the fresh water storage of lakes in our country is about

225 billion m^3 , it makes up 8 percent of the total fresh water storage (Table 1). These lakes have close relation with the people's life and economic development.

According to water conditions, wetlands can be reclaimed into high quality field, pasture, forest land, reed production base and aquatic products base,

Table 1 Area and storage of various lake regions in China.

Lake region	Area(km^2)	Storage ($\times 10^8 \text{ m}^3$)	Fresh water storage ($\times 10^8 \text{ m}^3$)
Qinghai-Xizang Plateau	36889	5182	1036
Eastern Plain	21641	711	711
Inner Mongolia-Xinjiang Plateau	9411	697	20
Northeast Plain	2366	190	177
Yunnan-Guizhou Plateau	1108	288	288
Others	372	28	28
Total	71787	7088	2260

so we think that wetland is an important water resource, also has important functions in water transportation, water storage, water supply and reducing flooding damage, etc.

3. Important Biological Resource

Wetland has the character of rich biodiversity^[2], is the habitat of lots of vegetation, animals and microbes, especially rare waterfowls breeding and over wintering area, as well as the important biologic species gene pool. Wetland is one of the richest biodiversity area in the world, birds occupies 21.6% of the total number of China, fishes make up 37.1% of the total number of China and 8% of the total fresh water fish number of the world. Within 57 kinds of endangered birds in Asia, there are 31 kinds in wetlands of our country, which occupies 54%, 9 kinds of cranes of the world live in the wetlands of our country, occupying 2/3. About 100 kinds of wetland higher plants had been listed as the higher endangered plant species in China. So we can see that wetland ecosystems, different biotic communities of wetlands and endangered species, etc. occupy an important place in scientific research in China, also in global biodiversity and wetland study in the world.

4. Environmental Effect of Wetlands

Wetland has huge functions of regulating environment and environment effects, it plays an important role in water storage, stream runoff adjusting, ground water supply and water balance maintenance^[3]. For example, the Raoli River in

the Shanjiang Plain, flood-plain marsh of a large area has developed between the Baoqing Hydrologic Station at its upstream and Laizuizi Hydrologic Station at the middle stream, the marsh rate is 32.7%. For the marsh flood water has storing function, the flood peak value of Laizuizi Station reduce to 1/2 (relative discharge) and flood season is retarded. Greenhouse gases discharges of wetlands has close relation with global variation, it has important effects on adjusting climate, controlling soil erosion, accelerating silting to form land, purifying polluted water and reducing environmental pollution.

III. PROBLEMS OF WETLAND RESOURCE PROTECTION

For a long period, since the contradiction between population and resources, energy, grain is getting more and more obvious, China's wetlands are facing to serious disturbances, such as large-scale reclamation, over-hunting of resources, industrial waste water pollution and species introducing. They have brought about the wetland quantity reducing and quality falling, furthermore it has effects on sustainable development. These problems are mainly as follows^[4]:

(1) Lake wetland reclamation leads to the loss of fresh water and the damage of biological diversity. The loss of lake area at the lower and middle reaches of the Changjiang River is 12,000 km², the loss rate is 34.16%. Such a large area loss inevitable results in the decline of biological species and population resources. For example Honghu Lake, from the 1950s to the 1980s, lost 45.6% of lakeshore land owing to reclamation, causing the continuous decrease of overwintering waterfowl number, the dominant species of the community *fulia atra* was replaced by large geese and ducks, hydrophytes decreased from 92 species in the 1950s to 68 species, fish decreased from 90 species in the 1950s to 31 species. By now the extinct lakes has reached more than 800, the total area of lakes has reduced to 11.5% of the original.

(2) The irrational reclamation of marsh wetlands leads to resource decrease and environment deterioration, for example the Sanjiang Plain, a large area of mires was reclaimed into dry farmland, the original island-shaped forests were cut down, mire vegetation was destroyed, resulting in the intensification of water erosion and wind erosion, local sandification, the decrease of rare plant and animal resource, in the Zoige Plateau of west Sichuan Province, the underground level of mire grassland drop, rat disaster is severe, sand dunes and salinization began to appear. The reed field area of the country has reduced from more than 10 million ha in the early period of the liberation to 5.05 million ha nowadays.

(3) It is more and more anxious about the continuous intensification of the pollution and eutrophication of lake water. At present, the number of lakes, which

have been polluted and are facing the eutrophication damage, has reached 70 – 75 percent of the total, such as Taihu Lake, from 1980 to now the discharge of phosphorus into the lake averagely increases 22 percent per year. In 1990 the eutrophication of the north waters of Taihu Lake resulted in that some factories in Wuxi City stopped producing or half-stopped producing for a week. The water pollution of Chaohu Lake, Tianchi Lake, Baiyangdian Lake, etc. leads to the shortness of water supply, seriously restraining the economic development of lake zones.

(4) Dams construction of rivers and lakes give full play in preventing floods and adjusting water storage, industrial and agricultural water supplies and transportation, etc. but it stops the migratory fishes coming into lakes to feed, the nutrient balance of the water body's food net was destroyed, fishes decrease sharply or disappear, the biodiversities of hydrophytes decrease, ecosystem hierarchy of environment is getting simple.

(5) The lakes and oases in the west of our country shrank because of the large quantity of water diversion of the mid-and-up streams and drier weather, water salinized. For example, Bosten Lake, as the Kaidon River is diverted to irrigate, the flow decreased, the water mineralization degree has increased from 0.39 g/L to 1.84 g/L, the area of lake reduced from 996 km² to 964 km², the reed resource area decreased from about 30,000 ha to about 20,667 ha, the precious fish is nearly extinct, Eqira oasis of Inner Mongolia Autonomous Region, which had been called "desert pearl", now is trapped into serious living crisis.

The problems mentioned above are only some aspects of wetland resources, with the development of society, it's necessary to deeply research the directions, intensities and sequences caused by human activities. A lot of works should be carried on for the protection and rational utilization of wetland resources.

IV. WETLAND RESOURCE PROTECTION AND RATIONAL UTILIZATION

In recent years, the Chinese Government has been paying great attention to the study on wetland protection and rational utilization. In 1992, China joined "The Convention on Wetlands of International Importance Specially as Waterfowl Habitat". After the Conference on World Environment and Development, the Chinese Government formulated "the 21 Century Agenda of China", and listed the wetland protection and rational utilization at the priority items of the agenda. At present, 132 natural reserves of various kinds of wetland have been founded in China, the area has reached $3,752 \times 10^4$ ha, of which 6 wetland reserves, Zhalong in Heilongjiang Province, Xianghai in Jilin Province, Birds island in Qinghai Province, Poyang Lake in Jiangxi Province, East Dongting Lake in Hunan Province, Dongzhaigang in Hainan Province famous in China, have been listed in

International Important Wetland List. In recent years, the Chinese Academy of Sciences has done much work about wetland studies and achieved many new results, especially in wetland resource protection and rational utilization. For the special national conditions of China, higher population pressure, China should carry out wetland resource protection and rational utilization, not only protection.

At first China should carry on environment quality evaluation, environmental effects evaluation, economic benefit analysis, study on sustainable resources utilization measures, etc. So it's very necessary to found normal experimental station of wetland protection and rational utilization.

(1) To select different kinds of wetlands with representiveness, on the basis of original works, to strengthen the normal station construction of wetland protection and rational utilization, to develop experiment of wetland protection techniques and rational utilization models, to take good ecological environment, social and economic benefits as the goal of sustainable wetland utilization.

(2) When select experimental station it should take account of the representiveness of wetland kinds, the representiveness of local wetlands, the utilization conditions and threats, working conditions, etc. So we can carry on the normal station construction separately at plain marsh, plateau marsh, mountains marsh, coastal wetlands, inland arid area wetlands, different kinds of lakes and artificial wetlands, through the normal station to show the effective wetland protection and economic development of wetland regions. In the Sanjiang Plain, an experimental station for mire protection and agricultural rational development has been set up, a paddy-reed-mire artificial wetland ecosystem has been established, its goal is to coordinate agricultural development and wetland protection, to found optimized model of comprehensive development of mire wetland. Through this method to relax and control human activities' damage to wetland ecosystem, to rationally exploit wetlands on the basis of protecting wetland resource biodiversity and environmental function, in final it will achieve the goal of sustainable utilization and development of wetland resources.

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