

WETLAND CONSERVATION IN CHINA

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Summary

According to preliminary statistics, there are in China 9.4×10^6 ha of mire, 8.0×10^6 ha of lake, 2.1×10^6 ha of saltmarsh, 2.7×10^7 ha of shallow sea (0-5 m), and 3.8×10^7 ha of rice paddy. The total area of wetland is therefore at least 8.45×10^7 ha. Wetland consists of natural wetland systems and man-made wetland systems. By considering hydrology, landform, soil, vegetation, etc, wetlands can be divided into the following types: marine, estuarine, riverine, lacustrine, and palustrine subsystems. On the basis of geology, geomorphology and vegetation forms, wetlands can be further subdivided into 26 classes. Wetlands provide unique landscapes and one of the most important living environments on Earth, with rich resources and many functions. At present, 336 different of Wetland Natural Reserves have been established in China, of which 21 have been listed as internationally important under "The Ramsar Convention on the

Conservation of Wetlands". In recent years a series of laws and regulations related to natural wetlands and ecological environmental protection have been promulgated, emphasizing that an adequate supply of good quality water plays a key role in wetland formation.

1. Definitions of Wetlands

Wetlands occur at the interface between land and water, where groundwater is lying at or near the ground surface, or there is shallow water lying on the ground. Wetland soils are an imperfectly drained or undeveloped. The vegetation consists of hydrophytes, hydrophilous plants or sometimes no plants.

There have been various definitions of wetlands but in this article we regard wetland as a permanently or temporarily water-logged area (the depth of which does not exceed 2 meters) of land, together with the epicontinental sea down to a depth of 6 meters at low tide, and forming a distinct ecosystem and biological community. Wetlands must meet one of the following conditions:

- There must be a plant community of aquatic macrophytes or halophytes;
- The substrate is dominated by aquatic soil, or
- The substrate is not soil, but it is water-logged and the site supports waterfowl.

2. Types, Characteristics and Distribution of Wetlands

China, located in the south-east of the Eurasian continent, has a land area of $9.60 \times 10^6 \text{ km}^2$ as well as a very large area of sea within the Exclusive Economic Zone. From south to north the country spans across 50 degrees of latitude, and includes five climate zones, including the tropical zone, sub-tropical zone, warm-temperate zone, temperate zone and frozen-temperate zone. From east to west it spans 52 degrees of longitude, and strides across the humid region, semi-humid region, semi-dry region and dry region. From the boundless stretch of the North-east China Plain, the Northern China Plain to the mountainous Yunnan-Guizhou Plateau, Qinghai-Xizhang Plateau, the landform types are complicated and many of them are globally rare. The uplift of the Qinghai-Xizhang Plateau not only creates a high altitude frozen climate, but also has important effects on the climate of the rest of China.

China has many diverse large wetland areas because of its complicated geographical environments and varied climate conditions. According to preliminary statistics, there are 9.4×10^6 ha of mire (areas where the land is water-logged or there is excessive moisture in the soil, with peat layers or gleyed horizons, and hydrophilous plants), 8.0×10^6 ha of lakes (no more than 2 m deep), 2.1×10^6 ha of saltmarsh, 2.7×10^7 ha of shallow sea (0 to 5 m deep), and 3.8×10^7 ha of rice paddy. The total wetland area is approximately 8.45×10^7 ha.

2.1. Principle and Basis of Wetland Classification

Wetlands in China have not been comprehensively investigated, and there is no complete systemic classification. But scientists have been researching mires and shores

for decades, and have now presented their classification systems.

Wetlands have developed under the influence of an aquatic environment, and water is confined by landforms, and affected by climate and its sources. Permanently moist or water-logged land, develops special processes and types of soil and vegetation, and it is difficult to reflect wetland primary attributes and characteristics based on a single-factor. Therefore a synthetic and systemic classification of wetlands is necessary for wetland science research.

Considering science and feasibility in deriving a synthetic classification system of wetlands, it is important to insist on the following three principles: (1) combine the synthetic principle and the generating principle;(2) combine dominant factors and secondary ones; (3) combine quantitative analysis with qualitative analysis.

Based on the above, when we establish a classification system, not only should we analyse water-quality, water source, landform types, soil and vegetation, but also consider the processes controlling wetland development and the changing character of wetlands. Different researchers may adopt different quantitative classification criteria, and choose different secondary or quantitative indices for their classifications.

2.2. Wetland Synthesis Classification System

Huang Jin-liang and Chai Shuming proposed that wetlands could first be classified into three wetland systems, namely rivers, lakes and man-made wetlands. This was based on the Jiangnan-Dongting plain wetland classification. Second, on the basis of seasonal changes of water level, the categories were subdivided into different wetland classes. They were then subdivided further according to soil, vegetation and geology.

Xu Qi *et al* classified wetlands into two groups: natural wetlands and man-made wetlands, and subclassified these into three grades: group, class, and form. When necessary, there could be further subdivision into sub-group, sub-class and sub-form, etc.

System	Subsystem	Class
Natural Wetland System	Marine	Shallow Sea Water Subtidal Aquatic Vegetation Intertidal Unvegetated Mud Sand or Salt Flat Intertidal Shore with Algae and Halophytic Higher Plants Rocky Marine Shore Sandy/Muddy Marine Shore Mangrove Coral Reef Coastal Salt Water Lake Coastal Freshwater Lake
		Estuarine
	Riverine	Permanent River and Stream Seasonal and Irregular Flowing River and Stream
	Lacustrine	Permanent Freshwater Lake Seasonal and Irregular Flowing Freshwater Lake

		Permanent Saltwater Lake Seasonal and Irregular Flowing Saltwater Lake
	Palustrine	Grassy Mire Moss Mire Swamp Carr Forest Swamp Wet Meadow Freshwater Spring Warm Water Wetland Saline Mire
Man-made Wetland System	Field-Pond System	Paddyfield Fish-Shrimp Pond Reservoir Salt Pan

Table 1. Wetland Classification in China

Lu Jianjian advanced, in his 1988 book "Chinese Wetland", that the Chinese wetlands could be classified into 22 types, based on the Ramsar Convention definition. He believed that natural wetlands can be divided into marine wetland, lake-river wetland and mire wetland system and then into 8 subsystems, and 31 forms. Man-made wetland was divided into 4 forms. The classifications mentioned above are helpful to the further research and understanding of wetlands, and are beneficial in setting up the classification system for China. We propose that wetlands can be divided into three grades: system, class and form, based on the primary investigation, and then they can be applied to a broad classification system (Cowardin, 1992; Liu, 1997; National Wetlands Working Group, 1998). If required, we can divide the different classification grades into sub-system, sub-class and sub-form.

Primarily, wetlands comprise natural wetland systems and man-made wetland systems. Natural wetland systems, on the basis of synthetic characters including hydrology, landform, soil and vegetation, etc., can be divided into the following groups: (1) Marine, (2) Estuarine, (3) Riverine, (4) Lacustrine, (5) Palustrine subsystem. Wetland class is the middle-unit in this wetland classification. On the basis of the substrate, degree of water-logging, and vegetation type, further subdivision can be made into 26 wetland classes. Man-made wetlands can be divided into field-pond wetland subsystems and four wetland classes (see Table 1). Wetland type is the base unit; it can be subdivided into different types, according to dominant plant (and animal) forms and type of components.

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Biographical Sketches

Zhao, Kuiyi, Professor, Tutor of Doctorate, was born in 1937, and graduated in Biology in the Northeast Normal University in 1962. From 1984 to 1986 he studied in the Department of Peatland Forestry, University of Helsinki, Finland. From April to October 1992, he was a visiting researcher with the Canadian Forest Service, Sault Ste. Marie, Ontario, Canada. From 1962 to the present he has been working at the Changchun Institute of Geography (CIG), the Chinese Academy of Sciences (CAS). Director, Department of Wetland Research, CIG from 1992 to 1997. He is a Member of the Commission for Wetland Research Center, CAS, and a Member of the Council of the Chinese Ecology Association.

He has been employed in mire wetland ecology for over 38 years and led more than ten major project of the Chinese Academy of Sciences and the National Fund for Natural Sciences, including Sanjiang Plain Mire Wasteland Resource Investigation, and the Qinghai-Xizang Plateau Science Investigation. He has been trained to supervise master students and doctorate students.

He has published over fifty articles and taken part in compiling works, such as: "Mires of China" (Editor in Chief), "Wetland Vegetation in China" (Vice-Editor in Chief), "Vegetation of China", "Vegetation of China," "Impact on Mire Environment of the Largest Forest Fire in the Da Xingan Mountains" (Editor in Chief) and "Study of Wetlands in China" (Vice-Editor in Chief), etc. He won the Chinese Academy of Sciences Advanced Science and Technology Special Prize and Second Prize, the Zhu Kezhen Field Science Work Prize, and the State Council Special Allowance.

He Chiquan was born in 1968. He is a Ph.D. Candidate in the Changchun Institute of Geography, the Chinese Academy of Sciences. His research interest includes wetland ecology processes and biodiversity.