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Along with the steady rise of science and increasing development of industrial and agricultural production, mankind more and more assumes it is his right to conquer the earth and change its form or nature. In the process, intentionally or unintentionally, he has opposed the laws of the natural world, destroyed the dynamic equilibrium of many ecosystems, and often brought catastrophe upon himself and other creatures. Forest denudation, grassland degeneration, the constant spread of deserts, and the pollution of the atmosphere and water systems are now common phenomena in many areas of the world.

From the ecological viewpoint, the establishment of protected areas in different natural zones or biogeographical regions will be of great advantage to society. To maintain typical natural ecosystems for advanced study and to provide a scientific base for rational utilization and restoration of nature are of overwhelming importance.

China, as with many countries in the world, has high regard for this important cause. More and more people are giving attention to expanding and strengthening this work.

Two reports on current work in conservation follow. The first is an overview excerpted from an article ("Nature Conservation in China: The Present Situation") by Professor Wang Xianpu, of the Institute of Botany, Academia Sinica, Beijing, that was originally published in *Parks*, Volume 5, Number 1, pages 1 to 10 (April/May 1980). (The above three paragraphs come from that article.) The second report ("Burretiodendron hsienmu Chun & How: Its Ecology and Its Protection"), by Professor Wang and two of his associates, focusses on efforts to preserve a valuable but endangered species of tree native to China and Vietnam. It has not been published before.

PLANT CONSERVATION: PART II

Nature Conservation in China: Two Reports



Protected Natural Areas in China

Wang Xianpu

The protected natural areas being established in China reflect the diverse needs of that vast and populous country

China is a populous country. Most parts of eastern China have been cultivated for millennia, and the remaining primary vegetation is not extensive. It will be very difficult to achieve real protection of natural areas if we do not consider this situation and accommodate the needs of industrial and agricultural production necessary for people's livelihood. In China, the establishment of a farm or forest plantation can proceed according to a distinct regulation, but not that of a protected natural area. Either pure conservation is emphasized, or the area is actually "under production" (albeit in name only). As a result, both conservation and production suffer, and their original goals are not attained.

Given conditions in China, the establishment of protected, natural areas should serve four primary functions: conservation, scientific research, production, and tourism. The areas should be bases for scientific research, production, and tourism, and such nature conservation as is undertaken should relate closely to the needs of production. Such protected natural areas thus will have full vitality and will include not only virgin regions, but also parts of developed regions. Different regions have different ways of being managed, but they may be subdivided into three related parts.

□ *Core Area*: The original vegetation of the natural landscape within a protected natural area is called the "core area." It should include the typical representative location of the natural landscape zone or natural biogeographic province. It must be strictly protected to avoid inadvertent destruction. The

main use is to carry on ecosystem studies of the relationship between the biological and environmental factors and among different ecosystems, and to study the role and significance of their existence in relation to industrial and agricultural production and people's livelihood, etc. Thus, it can provide basic information for environmental conservation and monitoring.

□ *Buffer Area*: A buffer area must be set up around the core area to prevent the destructive influences of human activity. The buffer area may be a semideveloped place composed of successional vegetation. Within this area we can undertake different experiments in the rational utilization and reformation of the vegetation according to practical needs. The work can include vegetation succession, multistory management of the community, and the breeding and feeding of animals.

□ *Experimental Area*: The protected natural area should also include a part that is exploited called "the experimental area." Based upon the environmental features of the locality and people's needs, we can exploit local biological resources, cultivate special native products, and establish artificial ecosystems. Thus, the area will play a typical and expansive role in vegetational renewal and in the establishment of artificial ecosystems of the same natural landscape zone. Necessary service facilities should be set up in suitable places for the needs of research and tourism. Since nature conservation is a popular cause, people should be encouraged to carry out the work together. Managers of protected natural areas still

must have links with related institutions of science, education, and production; invite their experts to serve as advisors and to work together when possible. The natural protected area must provide necessary and possible support, such as seeds, seedlings, and technical materials, for productive institutions, to make suitable contribution to industrial and agricultural production. Thus the protected natural area not only protects the original natural ecosystem, becoming a pool of the natural resources and a place of prevailing scientific knowledge and tourism, but also provides for rational utilization and reformation of the lands, and creates certain material wealth for society. Therefore, such an organization will certainly and easily get the support of the government and a welcome from the people. The workers themselves will be interested in their work and the cause of nature conservation will be advanced.

Although we have done some work in nature conservation, as compared with other advanced countries our effort falls behind. Up to 1979 we had established only about fifty natural protected areas, occupying only 0.16 percent of the total area of our country. The distribution of natural protected areas also is not adequate. Most of them are concentrated in the forest regions of the eastern half of the country. In the areas of steppe, the desert of the western half, marshland and coastline, etc., adequate reserves have not yet been established.

The management of existing protected natural areas needs to be improved. The contradiction between conservation and the needs of woodcutting, collecting medicinal herbs, and hunting has not yet been entirely solved. Destruction still occurs. Provisions for scientific research and investigation and tourism are, comparatively, in the primary stage. At present we are carrying on overall planning to strengthen the organization, and are ready to establish some protected natural

areas in the western part, and to increase the numbers of the protected natural areas in the eastern part of the country. The area of the increase will certainly not be too large, but the distribution must be treated as equally as possible.

The Main Types of Protected Natural Areas in China

The establishment of protected natural areas in one of the important ways natural resources can be preserved and safeguarded. These places are living natural museums and gene pools of biotic resources. They provide an excellent base for observing and studying the laws of nature, protecting and breeding rare or endangered plants and animals, introducing and acclimatizing valuable species, carrying out research on ecosystems, education, tourism, and so on. Different countries give different names to these places, such as national parks, national forests, protected areas, reserves, preserves, national biotic areas, managed resource areas, multiple-use management areas, and the like. Although these names have different specific meanings, depending on uses and limitations, their basic meaning is more or less similar. We consider that, as a whole, it is suitable to call these places "protected natural areas." We recognize however, that they differ from each other and the protected element usually is not the same. We may divide the present protected natural areas of China (Table 1) into the following several types and introduce them briefly:

□ *Areas for the Protection of the Whole Natural Landscape:* In general, this protected natural area is large enough to include different ecosystems of the whole natural landscape in a given location, and it must have enough area to provide living environments for the protected animals.

□ *Areas for the Protection of Special Types of Ecosystems:* The total size of these protected areas is not large enough, certainly, but they do protect mainly certain types of ecosystems and some species of rare animals and plants. They may be used for scientific research and collecting seeds or conserving water and soil. Most of the protected natural areas in the eastern part of China, especially in the tropical and subtropical mountains, belong to this type. In the future many more of this kind of protected natural area should be established according to actual needs.

□ *Areas for the Protection of Rare Species of Animals and Plants:* The establishment of this kind of protected natural area is determined according to actual condition and needs. For example, the remaining 3,000 trees of *Metasequoia glyptostroboides* in Lichuan, Hubei province, are distributed over an area of about 600 square kilometers. The protected area is based on the distribution of the feature protected. There are many bird islands, snake islands, and related lakes and other water systems in different regions.

□ *Areas for Tourism and Recreation:* There are many regions of attractive scenery in China. Most of them are connected with famous historical monuments and temples, and still there are small patches of natural forest and, rarely, some old trees. Natural scenery is attractive to tourists. Some areas have great value for scientific research. In general, organizations have been established to take the responsibility for management of these interesting places. But it is useful to put them into the category of protected natural area to strengthen their multiple use and management.

Vegetation Regions

The vegetation regions of China may be divided into three main groups, (a) the forest regions in the east, (b) the steppe and desert regions in the northwest and northeast, and

(c) the regions of high mountains and plateaus in the west and southwest.

Of the eastern forest regions, from north to south, there are (1) coniferous forest, (2) the mixed coniferous and deciduous broadleaf forest, (3) the deciduous broadleaf forest, (4) the mixed deciduous and evergreen broadleaf forest, (5) the evergreen broadleaf forest, (6) the tropical monsoon forest and rainforest, and (7) the tropical vegetation coral islands.

In the northern dry region, we distinguish, from east to west, the following regions: (8) the forest steppe, (9) the steppe, and (10) the desert steppe and desert.

Of the highland region, we distinguish: (11) the mountains of northwestern China, namely, the Chilianshan, the Tianshan, and the Aertaishan, (12) the mountains and plateaus of eastern Tibet, and (13) the Tibetan Plateau. There are particular types of forest, shrub, meadow, steppe, and desert in these regions.

Description of the Regions

The thirteen vegetation regions of China are described in the following paragraphs.

□ *The coniferous forest* occupies the extreme north of China. It embraces chiefly the Daxinganlin, a long and narrow chain of gneiss and granite mountains forming the uplifted margin of the Mongolian plateau. The average elevation of the region is between 500 and 1,000 meters.

Considerable area of forest is still preserved. Daxinganlin Nature Reserve was established in 1960 at the upper reaches of the Hanma and Nuomin rivers. With an area of some 480,000 hectares, it is the biggest protected natural area in China. At present the region is under exploitation, however, so the work of nature conservation must be strengthened.

□ *The mixed coniferous and deciduous broadleaf forests* are situated in the northeast corner of northeastern China. They include

the Changbaishan massif and a large portion of the Xiaoxingalin. This is the main forest region of China. Owing to the cutting of timber for a long time, the area of forest is being more and more reduced. The rational cutting and regeneration of the natural forest and silviculture of the artificial forest are the chief tasks of forestry management there. The matter of vegetation conservation cannot be delayed.

□ *The deciduous broadleaf forest* is principally the broad area stretching from the southern portion of the Manchurian plain to the northern shore of the Huai River and the northern slopes of Qinling. The region was exploited early. The plain is almost entirely under cultivation. In Qinling the Taibaishan forest region is well protected. The Taibaishan Nature Reserve was established in 1965. It occupies 54,158 hectares and includes all vertical vegetation types. In addition, there are many famous scenic mountains in the region, containing many celebrated places and historical ruins. They all must be brought under control as protected natural areas.

□ *The mixed deciduous and evergreen broadleaf forest*, the transitional region between the deciduous and the evergreen broadleaf forests, belongs more to the subtropical category from the viewpoint of vegetation analysis, so we call it northern subtropics. It includes the southern portion of Shanxi lying between Qinling and the Dahashan, large parts of Hubei province, and the Lower Yangtze Plain. The western part of the region is rugged, varying mostly from 800 to 2,000 meters in elevation, while the eastern part is an alluvial plain with hills rising from 100 to 200 meters.

The plain has been almost entirely cultivated. The climax community on the yellow brown soil of the mountains is mixed deciduous and evergreen broadleaf forest. At higher elevations one finds subalpine coniferous forest dominated by endemic *Picea*, and *Abies*, alpine bush, and alpine meadow. The vegetation of the limestone hills is deciduous broadleaf forest dominated by *Ulmus*, *Celtis*, *Zelkova*, etc. Owing to increased cutting of timber, the forested area is limited.

The hills and mountains are chiefly occupied by pine woodland, secondary bush, and grassland. It is very necessary to strengthen vegetation conservation. Several years ago protected natural areas were established on the southern slope of Qingling in Foping, Shanxi province, and Shennongjia, Hubei province. The latter reserve is about 2,000 hectares in area and is occupied by subalpine coniferous forest, in which the golden monkey and the Chinese dove tree (*Davidia involucrata*) are comparatively rare.

□ *The evergreen broadleaf forest*, which has a climate typical of the moist subtropics of eastern Asia, occupies a vast expanse in China. It may be divided into two subregions—the eastern and western. The former subregion is mainly influenced by the Pacific monsoon, and its climate is moist and warm, the dry and wet seasons not being distinct from each other. The latter is affected by the Indian monsoon; its dry and wet seasons are very marked.

There are twenty-seven protected areas in this region, most of established in the mid- to late 1970s. Fifteen of the areas were set up to protect the evergreen broadleaf forest itself. Because of the need to establish a large gene pool, and the need for forests for the conservation of water supplies, it is very necessary to establish many more natural protected areas. These will be of great advantage to biological research applied to meeting the needs of industry and agriculture.

□ *The tropical monsoon forest and rain forest* lie in the northern margin of the Tropics (the "Northern Tropics"). They include the southern part of Kuangdong, Kuangxi, Yunnan, and the extreme southern corner of Tibet and the islands of Hainan and southern Taiwan. The task of nature protection is large and very urgent in this region. Five areas have been set up for the protection of tropical forests; besides these, there are several smaller areas for special protection of rare animals on Hainan. It is also necessary to protect mangroves, which have been much damaged recently.

□ *The coral islands of the South China Sea* experience frequent typhoons and strong

winds. The typical vegetation consists of tropical shrubs growing on coral islands, such as *Pisonia grandis*, *Guettarda speciosa*, and *Scaevola sericea*.

□ *The forest steppe* is a transitional zone between the forest to the east and the steppe to the west. It may be divided into two subregions, the northeastern and the northwestern. Their common features are large patches of woodland alternating with grassland. The northwestern subregion has been exploited for thousands of years. The destruction of forest, problems of waterlogging and soil erosion are all extremely severe. Sand and silt in the lower reaches of the Yellow River originate in the loess plateau of the northwestern subregion. To regulate the Yellow River, it will be necessary to strengthen efforts to protect the loess plateau by planting grasses and forests to prevent waterlogging and soil erosion.

There is only one protected natural protected area in the region, in the wetland of Zhalong, near Qigihari city, Heilongjiang province, to protect the red-crowned crane and other water birds. Ziwuling and Haunglongshan are suited for the establishment of protected natural areas.

□ *The steppe* occupies largely the Inner Mongolian plateau west of the Daxinganlin and north of the loess highlands. The climax community is *Stipa* (a grass) steppe. Because of inadequate management, the grassland is being very severely denuded. It is urgently necessary to strengthen vegetation protection by rational utilization and restoration of the grassland. No protected natural areas have been established in this region, but six or seven years ago an experiment station for the study of steepe ecosystems was founded in Inner Mongolia and plans made to establish a protected natural area.

□ *The desert steppe and desert* include the western part of Mongolia, the northern part of Gansu, the Talimu and Zhungeer basins of Xinjiang, and Chaidamu basin of Qinghai. This region is mostly surrounded by high mountains that keep out the moist winds from the distant oceans. Glacial meltwater from the mountains irrigates many oases,

where cotton, grapes, melons, and some vegetables grow very well. Because the soils are dry and saline, it is difficult to exploit virgin land. Recently, certain shrublands and woodlands have been severely damaged. There is an urgent need to strengthen the management of the species that have been damaged.

□ *The mountains of northwestern China* consist of three sections, (1) the Tianshan, (2) the Qilianshan, and (3) the Aertaishan. (The suffix *-shan* means "mountain range" in Chinese.) The foothills of Tianshan are desert; higher up, the desert is gradually replaced by desert steppe, above which is the mountain steppe dominated by grasses (*Stipa*, *Festuca*, *Koeleria*, etc.). Qilianshan, situated at the northern limit of the East Tibetan Plateau, marks the boundary between Gansu and Qinghai provinces. *Picea crassifolia* occurs in pure stands on the northern slope of Qilianshan. Clear cutting of large areas of the *Picea* results in the formation of bushland or aspen woodland. From lowland up to the mountains in Aertaishan, desert steppe, mountain steppe, subalpine coniferous forest appear in succession. Occasionally, elfin wood and alpine tundra also occur. Protected areas are very urgently needed because these mountain forests are very slow to recover if they are destroyed.

□ *The mountains and plateau of East Tibet* encompass the eastern part of Tibet, northwestern Sichuan, and northwestern Yunnan. The region is heavily wooded, ranking second only to northeastern China in this regard. The contrast between cutting of timber and protection of the forest is more and more marked. The establishment of protected natural areas cannot be delayed.

□ *The Tibetan plateau* is a lofty plateau rimmed by even loftier mountains—the Kunlun to the north, the great Himalaya range to the south. The average elevation of the whole region may be taken as from 4,700 to 5,300 meters. Under cold and dry climate, winters are extremely severe; even in summer the temperature scarcely rises above the freezing point. From southeast to northwest, there is a clear zonal distribution of vegetation, namely, high cold meadow dominated

by *Kobresia*, and cold steppe dominated by *Stipa purpurea*, high cold desert composed of *Ceratoides compacta* and *Ajanía fruticulosa*. In these communities different cushion plants

grow which are seldom seen in the northern steppe and desert of lower elevation. There is a great need to establish natural protected areas in this region.

Table 1. Protected Natural Areas in China as of 1980

Name of Protected Area	Location (Province)	Area, hectares	Year Established	Main Protected Element(s)
Fenglin Forest Reserve	Heilongjiang	18,400	1963	Red pine and deciduous broadleaf mixed forest
Qiqihari Zhalong Crane Sanctuary	Heilongjiang	42,000	1976	Red crowned crane and wetland ecosystem
Hanma-Hujin Daxinganlin Nature Reserve	Heilongjiang	480,000	1960	Coniferous forest dominated by <i>Larix</i>
Changbaishan Nature Reserve	Jinlin	215,110	1960	Different ecosystems and northeast tiger, sika deer, <i>Panax schinseng</i> , <i>Boschniakia rossica</i> , etc.
Luda Snake Island Sanctuary	Liaoning		1963	Snakes
Qinghaihu Waterfowl Island Sanctuary	Qinghai	7,850	1975	Waterfowl
Baishuaijiang Nature Reserve	Gansu	95,292	1963 (1978)	Subalpine coniferous forest ecosystem and giant panda, golden monkey, etc.
Taibaishan Nature Reserve	Shanxi	54,158	1965	Different ecosystems
Foping Yueba Nature Reserve	Shanxi	35,400	1978	Subalpine coniferous forest ecosystem and giant panda
Wenchuan Wolong Nature Reserve	Sichuan	200,000	1975	Subalpine coniferous forest ecosystem and giant panda
Nanping Baihe Nature Reserve	Sichuan	20,000	1963	Subalpine coniferous forest ecosystem and giant panda
Nanping Jiuzhaigou Nature Reserve	Sichuan		1978	Subalpine coniferous forest ecosystem and giant panda
Pingwu Wanglang Nature Reserve	Sichuan	27,700	1965	Subalpine coniferous forest ecosystem and giant panda
Hainan Nanwanling Wildlife Sanctuary	Guangdong	930	1965	Macaque
Heyuan Xingang Wildlife Sanctuary	Guangdong	2,500	1976	Rare animals

Name of Protected Area	Location (Province)	Area, hectares	Year Established	Main Protected Element(s)
Luyuan Wuzhishan Chingjendong Nature Reserve	Guangdong	5,000	1976	Evergreen broadleaf forest and rare animals
Ledong Jianfengling Tropical Forest Reserve	Guangdong	1,635	1960	Mountain rainforest
Zhaoging Dinghushan Nature Reserve	Guangdong	1,140	1956	Evergreen broadleaf forest
Nanjing Hexi Dadoushan Forest Reserve	Fujian	15	1963	Evergreen broadleaf forest
Sanming Shengkou Forest Reserve	Fujian	800	1960	Evergreen broadleaf forest
Jianou Wanmulin Forest Reserve	Fujian	110	1976	Evergreen broadleaf forest
Wuyishan Forest Reserve	Fujian	56,666	1978	Evergreen broadleaf forest
Linan Xitianmushan Forest Reserve	Zhejiang	2,000	1962	Evergreen broadleaf forest
Taishan Wuyanlin Forest Reserve	Zhejiang	2,000	1975	Evergreen broadleaf forest
Longquan Fengyangshan Forest Reserve	Zhejiang	2,000	1975	Evergreen broadleaf forest
Kaibua Gutianshan Nature Reserve	Zhejiang	2,000	1975	Evergreen broadleaf forest
Wuhu Alligator Sanctuary	Anhui		1977	Chinese Alligator
Qianshan Wuyishan Forest Reserve	Jiangxi	1,400	1977	Evergreen broadleaf forest
Longnan Joulanshan-Forest Reserve	Jiangxi	700	1976	Evergreen broadleaf forest
Yutoriqli Tiebu Wildlife Sanctuary	Sichuan	30,000	1964	Sika deer, etc.
Tianguan Labahe Nature Reserve	Sichuan	12,000	1974	Takin, etc.
Qingchuan Tangjiahe Nature Reserve	Sichuan	40,000	1978	Subalpine coniferous forest ecosystem and giant panda
Liangshn Dafengding Nature Reserve	Sichuan	40,000	1978	Subalpine coniferous forest ecosystem and giant panda
Baoxing Dachugou Nature Reserve	Sichuan	40,000	1975	Subalpine coniferous forest ecosystem and giant panda
Beichuan Nature Reserve	Sichuan	10,000	1979	Subalpine coniferous forest ecosystem and giant panda



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