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Management Plan

Of Shilin (Stone Forest) Karst, Yunnan

The Management Bureau of the Shilin National Park

October 2005
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1. An introduction

The well-known Shilin (Stone Forest) karst is located in the Shilin Yi Nationality Autonomous County, Kunming City, Yunnan Province. Because of its impressive karst landscape and exceptional natural beauty, Shilin was formally established as Stone Forest Park in 1931 by Yunnan provincial government. Subsequently, in 1982, the Stone Forest was designated as China’s National Park (also known as National Key Scenic Area) by the central government, and in 2001, designated as China’s National Geopark, and in 2004, the Stone Forest was listed in the Global Geopark Network by the UNESCO. Currently, the Stone Forest is also an important component part of the proposed South China karst world natural heritage.

1.1 Location

The Shilin National Park, located at 24°30’ to 25°03’north latitude and 103°10’to 103°40’east longitude, is situated in the middle of the Shilin Yi Autonomous County\(^1\) in Yunnan Province of China. With convenient transportation, it is 78 kilometers northwest from Kunming, the capital city of Yunnan Province. Both railways and highways are accessible to Kunming, Nanning and other major cities and towns.

1.2 Physical geography

1.2.1 Topography and Geology

The Shilin National Park stands in the west of the Yunnan-Guizhou Karst Plateau of the Southwest Karst Region in China, the most extensive karst area in the Globe. It lies in the intermediate terrace between the first terrace (Qinghai-Tibet Plateau) and the third terrace (Hills and Plains in the East) of China. The plateau surface there lightly undulates with mild cutting. With the main altitudes from 1700 to 1950m a.s.l, the highest point is Wenbi Mountain, at 2203m a.s.l. in the south of the Park, and the lowest point is 1560m a.s.l., at the foot of the Grand Waterfall in the southwest of Shilin County. The general topography of the Park is high in the northeast and low in the southwest, high in the east, and low in the west. The west side of the Park is Lunan Basin, formed in paleogene and the typical faulted-basin found in China.

\(^1\) Before 1998, it was Lunan Yi Autonomous County.
The geological history of the Shilin National Park is complex, but the geological structure is simple and the joint networks well developed. The main strata is that of Sinian, Cambrian, Silurian, Devonian, Carboniferous, Permian to Paleogene and Quaternary, and the rocks are carbonate rocks, clastic rocks, argillites and basalts. With concern to the tectonics, the Shilin National Park with some small faults lines in the west wing of the significant anticlinoria (Mountain Niushou paleo-land) in Middle Yunnan. There are regional faults respectively in the east side and the westside of the park. One of them is the Jiuxian-Shiyakou fault in the northwest side of the park, extending from the northwest side to the Grand Waterfall and in multiple phases. And in the southeast side there is the Weize fault extending from the northeast to the northwest. Two faults dominated the evolution of landforms of the park that was a down block between the two faults. Apart from that, there is also a developed joint system. Having got rid of the oceanic environment since the later period of the middle Permian epoch, the Shilin area had always been ascending and denudating. Impacted by the closing of Paleo-Tethys Ocean and Himalayan Movement, the Shilin area experienced the dramatic changes from a littoral environment to the hill and the plain environment of a low latitude and low elevation, and finally the plateau river environment, and from continental basalt eruption to faulted-lake deposition. From such a complicated geological evolution, the Stone Forest came into being.

The dominant Karst landforms are that of Stone Forest, the karst hills, dolines and depressions, karst valleys, underground rivers and caves, lakes and waterfalls, the Stone Forest of which is notable worldwide. The Stone Forest refers to densely packed pinnacles from 5m to 40m high and fluted by sharp Rillenkarren, a typical kind of pinnacle karst formed on a low plateau of gently dipping limestone. It is Shilin Park that is the home of Stone Forest and provides representatives of the immense variety of the Stone Forest. There are four main varieties found in the Stone Forest: the sword-shaped Stone Forest, the pagoda-shaped Stone Forest, the mushroom-shaped Stone Forest, stalk-shaped Stone Forest, as well as spitzakarren rock city. In terms of evolution perspective, there is the paleo-Stone Forest, the petrified Stone Forest, the developing Stone Forest and the basalt-baked Stone Forest.
1.2.2 Climate

The Shilin National Park, encounters subtropical-plateau monsoon season in a low latitude, is characterized by a climate of “neither too cold in winter nor too hot in summer, the all spring-like four seasons, and a clear separation between the rainy season and dry season”. The annual mean rainfall reaches 967.9mm and the whole year can be divided into two seasons according to rainfall: one being the rainy season from May to October, taking up 80% to 88% of the total rainfall, and the dry season from November to the next April, only 12% to 20%. Since 1965, the annual mean temperature holds at 15.5°C with the highest temperature at 20.8°C in July and the lowest at 8.2°C in January. The highest temperature was 33.6°C on May 1, 1966, and the low, -8.9°C after the heavy snow on Dec. 29, 1983. The annual transpiration is about 2097.7mm, with the maximum of 321.1mm in April and the minimum of 105.6mm in November.

The southwest winds dominate the whole year, with the southeast, northeast and northwest incurring the rest. The average wind speed is 3m per second, and exceeds 4.1m per second in March and April, and reaches to 1.9m per second in August. Nature disasters include drought, flooding, low temperature, frost, hailstone and gale.

1.2.3 Soil, Vegetation and Biological Diversity

The Typical soils in Shilin National Park are red earth, locally called as the specific plateau mountain red earth, and calcareous soil.

The Shilin plant geography belongs to the Pan-Arctic flora, the Sino-Himalayan forest subrealm, the Subregion of Central Yunnan Plateau. The area, 32% covered in forests, conserves and lays out the typical subtropical plateau karst ecosystems. There are 7 kinds of vegetation types: evergreen broad-leaves forest, sclerophyllous evergreen broad-leaves forest, deciduous broad-leaves forest, subtropical needle-leaves forest, the shrubs and grassland with sparse trees, shrub, meadow , and one kind of the typical plateau karst lake aquatic community—plateau Ottelia acuminata community. Among the vegetation, Castanopsis delavayi forest, Cyclobalanopsis glancoides forest and Cyclobalanopsis delavayi forest are representatives of plateau karst evergreen
broad-leaves forests; sclerophyllous evergreen broad-leaves forests, such as *Quercus cocciferoides* forest and *Quercus franchetii* forest, are ancient epibiotic having derived relation with paelo-Tethys vegetation.

In Shilin Park, there are a wide variety of seed plants divided into 72 families, 615 genera, 820 species. There are 8 species belonging to a national level protected species, such as *Psammosilene tunicoides*, *Paeonia delavayi franch.var.lutrea*, *Ottelia acuminata*, etc.; 20 species from provincial level protected, such as *Gleditsia delavayi*, *Zizyphus mairei*, *Hymenodictyon flaccidum*, etc.; over 100 species from the endemic and rare plants in the Shilin County, Kunming City and the Yunnan province, such as *Impatiens loulanensis var. intermedia*, *Salvia breviconnectivata*, etc. 30 species in the Shilin park are now included in The Species Red List of China.

Based on historical records and present surveys, there are 185 Chordate species in the Shilin area, including 42 mammal species, 87 bird species, 32 reptile species, 12 amphibians, and 12 fish. Among them, there are 7 mammal species and 8 bird species under the protection of the national level at the second class.

1.2.4 Hydrology and Water Resources

The head water of The Ba River, the main river in Shilin County, originates from the north part of the Shilin National Park. The Ba River runs into the center of the Park from the northeast to the southwest, passing by Lunan Basin, and finally at Grand Waterfall, going into the river Nanpan of the Pearl River System, an important water system in South China. Besides the Ba River, there are more than eighty Karst lakes in the Park, for examples, the Changhu Lake, the Yuehu Lake, and the Yuanhu Lake, and more than fifty ponds and springs. Nine subterranean rivers had been discovered (Tab.1-1). The abundant water resource in the park, on the surface and underground, reaches $2.72 \times 10^8 \text{m}^3$, accounting for 47.9% of the total water amount in the county, in which the underground water reaches $0.91 \times 10^8 \text{m}^3$, 33.4%. The park is located in the upper part of the Lunan Basin, the productive and living center of the Shilin County, and provides the spaces for the key water reservoirs and water conservtories of the County, which provides nearly 70% of all the water used.
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Location</th>
<th>elevation (m)</th>
<th>Areas, depth</th>
<th>Strata</th>
<th>Extending Direction</th>
<th>Hydraulic Gradient</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stone Forest lake</td>
<td>Mid Part</td>
<td>1750</td>
<td>0.3 km²</td>
<td>P₂, E</td>
<td>NE-NW</td>
<td></td>
<td>Modified karst lake, Pinnacle-acrete karst in the lake. Yi ethic villages beside the lake</td>
</tr>
<tr>
<td>2</td>
<td>Lv-fang reservoir</td>
<td>Mid Part</td>
<td>1762</td>
<td>0.4/</td>
<td>P₂</td>
<td></td>
<td></td>
<td>Built up from small karst lakes, Stone Forest slope, Stone Forest hills along the bank of the lake, Eocene system occurring on the banks of the lake.</td>
</tr>
<tr>
<td>3</td>
<td>White cloud reservoir</td>
<td>Naigu</td>
<td>1827</td>
<td>&gt;2 km²</td>
<td>E, P₃₀</td>
<td></td>
<td></td>
<td>Also called the Tuanjie reservoir, built up from the small karst lakes and occurring beside the Naigu shilin, catchments areas of the Ba River.</td>
</tr>
<tr>
<td>4</td>
<td>Changhu reservoir</td>
<td>South Part</td>
<td>1890</td>
<td>0.54km²</td>
<td>D, C, P₁</td>
<td>E-W</td>
<td></td>
<td>Distributing into Fengcong and built up from small karst lakes. Form: Pinus yunnanensis, semi-humid broadleaves forest around the reservoir, typical aquatic vegetation of Yunnan-Guizhou karst plateau lakes (Form: Ottelia acuminata); firstly constructed in the early 17th century.</td>
</tr>
<tr>
<td>5</td>
<td>Yuehu reservoir</td>
<td>North Part</td>
<td>1880</td>
<td>2.97km²</td>
<td>D</td>
<td>Nearly E-W</td>
<td></td>
<td>Distributing into the karst hills, semi-humid broadleaves forests and planted coniferous forests along the banks of the reservoir, Yi ethnic villages around the reservoir, firstly constructed in the later 16th century.</td>
</tr>
<tr>
<td>6</td>
<td>Heilong-tang Reservoir</td>
<td>Mid and South Part</td>
<td>1708</td>
<td>1.5 km²</td>
<td>P₂, E</td>
<td>NE-SW</td>
<td></td>
<td>Constructed in 1545 and colleting water from ascending karst springs. Stone Forest crest and Stone Forest slope around the reservoir, sparse coniferous vegetation and caves are also around it.</td>
</tr>
<tr>
<td>7</td>
<td>Heishan-Sibeihou sinking stream ( -1)</td>
<td>North Part</td>
<td>1814--1844</td>
<td>2km²</td>
<td>P₂</td>
<td>300--325°</td>
<td>15%o</td>
<td>Distributing in the north of the Park and extending to 300–325° in direction, the depth being 6~10m, the flow being 172–4.69 l/s, but changing greatly, three top windows along the underground river, occurring as ascending springs and entering into the Ba river; spitzakarren rock city, Stone Forest slope and Stone Forest hills being along the river.</td>
</tr>
<tr>
<td>8</td>
<td>Maoshezu-Xia ocun village sinking stream ( -1)</td>
<td>Northwest Part</td>
<td>1880--1870</td>
<td>2.6km²</td>
<td>C, P₁</td>
<td>Nearly E-W</td>
<td>3.6%o</td>
<td>Distributing in the north-east of the Park and receiving direct runoffs for recharging; extending in a 250° direction; the depth being 7–10m, flow quantity being 1134–18 l/s, karst hills and solution depression raising above the river level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tab. 1-1 the main karst lakes and subterranean rivers</th>
<th>Features</th>
</tr>
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<tbody>
<tr>
<td>No</td>
<td>Name</td>
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</tr>
<tr>
<td>No.</td>
<td>Subterranean River (Code)</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Xiaolinkoupu-Tianshengguan-Beidacun Village Sinking Stream (-2)</td>
</tr>
<tr>
<td>10</td>
<td>Tongjiazhuang-Tianshengqiao Sinking Stream (-3)</td>
</tr>
<tr>
<td>11</td>
<td>Shuitangpu-Bailongtang Subterranean River (-4)</td>
</tr>
<tr>
<td>12</td>
<td>Weiboyi-Heilongtang Subterranean River (-5)</td>
</tr>
<tr>
<td>13</td>
<td>Maoshuitong Cave Subterranean River (-6)</td>
</tr>
</tbody>
</table>
1.3 Human geography

1.3.1 Nationalities and Population

The seven sites of the paleolithic relics were found along the banks of the Ba river lower course, and the neolithic relics in caves near Lake Yuehu. The population there is made up of 20 ethnic nationalities such as Han, Yi, Miao, Zhuang, Bai, Hui, Hani, Wa, Dai, Yao, Lahu, Shui, and Lisu etc. Among these, Yi people amount to 33.3% of the total, and in the southern part of the park, the Yi nationality reaches 90%. There are over 50 villages in the park, respectively distributed to the depressions, lakesides, and the intermediate belt between karst hills and basins. The population density reaches to 160/ km². However, the Core Zone, for the South China karst World Heritage Nomination, is low in population density, 17 persons / km² with 4000 local people inhabited, most of them being Sani people, a branch of Yi nationality.

1.3.2 Land use and economic activities

Of the 350 km² of the Shilin National Park, farmlands hold 39.9%; forest 36.2%; Stone Forests18.5%; water2.4%; all kinds of constructed fields 2%; lone hills and grassland 1.7%. But, in the Core Zone of the 120.7 km² area, there is only 1.07% farmland.

The land tenure in the park is diversified such as state-owned, rural collectives-owned, contracted by inhabitants and by enterprises.

1.3.3 Economy and Folk Cultures

The main economic activities are involved into the tourist industry, agriculture, and stockbreeding. The income form tourism consists of the main part of the revenue of the local government, and the income of local inhabitants varies from the tourist industry, the service industry, farming, the animal industry, and the construction industry. With the annual net income of the rural resident reaching 2800 yuan, and that of the urban population reaching 6000 yuan, the mean annual income of people in the tourist spots of the park is considerably higher than that of the people in other places of Shilin County.

The local ethnic culture has a strong identity, including folk culture, costumes, arts and crafts, all kinds of ethnic festivals (e.g. Torch Festival), and ethnic songs and dances performance. All of them have been the important tourist attractions for Shilin tourist
industry.

1.4 History of the Shilin Park

Shilin Park was firstly officially designated in 1931, and in 1942 the Construction Committee of Shilin park was founded by Lunan County, and then in 1964 the Stone Forest Management Division was founded. In June of 1980, the jurisdiction of the park was transferred from the provincial government to the Shilin (Lunan) County government. On Nov. 8th 1982, Shilin Park was issued by the State Council of the P.R.C. to be the national key scenic region or National Park, and The Management Bureau of Shilin National Park was authorized in June 1992. In March of 2001, Shilin National Geopark was officially designated by the Ministry of Land and Resources and it was then issued as a member of the Global Geoparks network with the assistance of UNESCO in February of 2004. Even with multi-attributes, the administration of the park is the only management setup and responsible for the management of the Stone Forest and landscapes, as well as other valuable heritages in the park.

1.5 Identity, Functions, Size, and Zones of Shilin National Park

Identity: Conserving Stone Forest/Shilin karst that is a characteristic of global significance, distributed in the Core Zone of Shilin National Park, and as well related to folk cultural heritages.

Functions: firstly carry out an effective comprehensive strategy for protecting Stone Forest, geologic relics, natural environment, and water reserves; secondly on the basis of the principle of the ecological and cultural sustainability, efficiently develop the Stone Forest, local cultural resources for promoting the development of the local society and economy and culture.

Area and zoning of the Park: total area is 350 Km², the core zone is 120.7 km², including a superfine protective zone and the first level one identified in the revised Master Plan of Shilin National Park in 2004; the Buffer zone is 100.21 km², including in the second level protective part in the Master plan, and the Proving Zone/Tourist serving zone with protected farmland is 129.09 km², including the third level protective zone in the Master Plan.
1.6 Key Points of the Management Plan of Shilin National Park

1.6.1 Formulating and Responsible Organizations


1.6.2 Ends of the Management Plan

(1) Carrying out the strategy of the developmental purposes designed in the revised Master Plan of the Shilin National Park (2002-2030) in 2004.

The purposes include protecting and improving the natural environment of the park via applying an inscription to the World Heritage list in terms of the criteria of the World Heritage, especially protecting Stone Forest, natural vegetation and local ethnic culture; to improve infrastructure and serving facilities of the park for promoting sound development in regard to the Shilin tourist industry and better serving the social-economic developments of the Shilin County; to play a key role in deriving a coordinated development of the surrounding towns and villages evenly; and to make the Park into one of the top-ranking parks, famous both domestically and worldwide.

(2) Ensuring the effective protection of the natural heritages that meet the criteria set up by the Operational Guidelines of Implementation of the World heritage Convention.

The stone forest in the park meets the basic criteria VII and VIII for the World Heritage.

Criteria VII: Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

The property of the park which is suitable for Criteria VII is the vivid Stone Forest which is not only combined with a plateau landform, red earth and forests, but also merges into ethnic cultures, living concepts, and art pursuits. It achieves great view and admirational values. In addition, Stone Forest is reputed as the “Source of Gardening” owing to its dramatic shapes and the “model of Chinese Classic Gardening”.

Criteria VIII: Have superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance, with potential for significance as models to be followed in the study and practice of conservation and management.

The Stone Forest is also a national natural monument. Since the Stone Forest in the park is the vivid Stone Forest, it has the potential for significance as a model to be followed in the study and practice of conservation and management.
Criteria viii: Be outstanding examples representing major stages of the earth’s history, including the records of life, a significant on-going geological process in the development of landforms, or significant geomorphic or physiographic features.

The corresponding characters of the park are the unique Stone Forest/Shilin karst and its unique long evolutionary history. The Shilin karst is an extreme form of epikarst landform composed of pinnacles and spires of up 30–50m high and fretted with rillenkarrens and other impressive karrens. On the rolling plateau surface, with altitude of 1720–2200m, numerous stone forests distribute in patches and clusters on various topography, from hilltop to slope, from depression to basin, from valley to lake, every one having an impressive feature. On the world scale Stone Forest is unrivalled in the multi-phase complexity of its morphological evolution from the later period of the middle Permian epoch, to the present, and a wonderful combination of various phase’s morphology. It encompasses within just one district all representative styles of ‘Stone Forests’. Individually, a stone pillar or column may take the shape of a needle, fin, spire, mushroom, or whatever unusual shape. Collectively, Stone Forest patches occur as a pinnacle, column, mushroom, and/or pagoda groups together with more irregular shapes. Shilin Park gives a wonderful picture of geological evolution history of the Yunnan-Guizhou Karst plateau of Southwest China from the later Permian epoch to the present.

(3) Perfect management of integrity of the Shilin Park in terms of requirement from the operational guideline of the World Heritage convention.

The integrity required refers to a measure of the wholeness and intactness of the natural and/or cultural heritage and its attributes. The contents of the integrity include all elements necessary to express its outstanding universal value, and the adequate size to ensure the complete representation of the features and processes which convey the property’s significance; and to suffer from adverse effects of development and/or neglect; and the relative intactness of biophysical processes and landform features. Even so, attention should be paid to the dynamic state of the natural areas and their contact with
people, such as human activities from traditional societies and local communities in the nominated area. As long as all of these activities are ecologically sustainable, they can be considered to be consistent with the outstanding universal value of the place.

With the basis of Criteria vii, the integrity of the Stone Forest comprises all the attractions maintaining its natural beauty and the space exhibiting its wholeness; and with Criteria viii, it covers all or most of the elements related to Stone Forest, both their landscapes and evolving relics, as well as its intact space.

Hence, the required items in the Shilin National Park include: the distinct heritages and enough space for effectively protecting them, such as various kinds of Stone Forest, their evolving relics, and correlating physical phenomena, e.g. vegetation, soil, and Karst hydrology; the clear boundaries of the nominated area with strong land-marks; the perfected laws and ordinances; the executable Master Plan; the improved management framework with corresponding staff; and the acceptance and involvement of both the communities and the residents in the park management.

(4) Realizing the social-economic goals of development stated in the revised Master plan for Shilin National Park, and ensuring the development of the park along with direction described by the Master Plan and the Operational Guideline for the Implementation of the World Heritage Convention.

The social-economic developing goals stated in the Master Plan of Shilin National Park are:

- improve the general social quality by nominating Stone Forest to the World Heritage and the World Geopark;
- promote sustainable development of the Shilin tourism industry;
- improve regional agricultural development by readjusting the agricultural structure and environmental rehabilitating, diversified agricultural economy, and constructing ecological sightseeing farm belts;
- prove eco-agricultural villages characteristic of Sani Ethnic traditions by improving the villages in the Shilin areas and by developing rural cultures, especially the Yi culture;
readjust rural domestic energy structure and produce patterns which are contradictory to the protection of the park and diminish pressure on karst environment as much as possible;

- improve rural communities’ infrastructures; develop rural education and train the local people in regard to practical skills and make a fare and just mechanism which benefits local stakeholders from the Shilin tourist industry, no matter who, communities, local farmer and town residents and enterprisers, government’s units; and do its best to improve living conditions for local communities and residents

- make managers and other stakeholders aware that the utilization of the property of the Shilin Park must be ecologically and culturally sustainable, and can not damage the values, integrity and/or authenticity, and therefore, some construction and models of developing resources in the park are not accepted by the future of the park and the Criteria

(5) Efficiently put into effect the environmental goals stated in the revised Master Plan of Shilin National Park.

- strictly protect the stone resources such as Stone Forest both on surface and underground and natural vegetation

- carry out the strategy of revegetation in the core zone and other protective zones, cultivate scenic vegetation for both improving the landscapes and enhancing the values of the park

- focus on rehabilitating and restoring the damaged landscapes and plots from quarrying, farming, and road building

- protect the headwater areas and water resources, especially the underground water;

- Strictly carry out environmental standards and procedures set by government and corresponding regulations, and do its best to dispose the wastes and sewage from all activities in the park.

- Generally, the ultimate purpose of environmental construction and protection is to make Shilin National Park into an outstanding identifying characteristic of the unique Stone Forest, geologic relics, naturalness, local ethnic cultures and
the finest attractions through coordinating local various causes and industries.

1.6.3 Brief summary of the Management Plan

(1) Identifying values of interest in Shilin National Park, and ensuring the required space for protection of the park

(2) Arguing matters threatening the values of the park, and defining its development and the corresponding aims of management

(3) Putting forward an effective strategy for zoning and classifying the park management and implementing aims for the protection of values of the park and its basic space

(4) Providing the sub-area’s plans of management and executing points for the integral development of the park and the realization of the social and economic aims of the local region.
2. Values of the Shilin karst and its protected situation

The main protected objectives in the Shilin National Park are the Stone Forest/Shilin karst, relative geological relics and naturalness of the park, as well as the Sani culture of the Yi nationality. The Stone Forest is the key item being nominated to the South China Karst World Heritage Nomination.

2.1 Values of the Park

With comparison of Stone Forest to other karst sites worldwide, particularly those inscribed on the World Heritage List, the key values of the Shilin national Park have been assessed to be a scientific, aesthetic, cultural landscape, as well as a water source area. Among these, the scientific and aesthetic values provide the basis for the park joining the South China Karst World Heritage Nomination.

2.1.1 Scientific values

“Stone Forest” is probably the earliest recorded karst term in the world. As an unusual and special landscape, Stone Forest attracted people’s attention long ago, the term “Stone Forest” appeared for the first time in a famous poem “Ask Heaven” written by ancient Chinese poet Qu Yuan 300 B.C. It was questioned in the poem ‘Is there really a Stone Forest in the world?’ In 1931, the former Yunnan provincial governor Long Yun visited Shilin in his inspection tour, greatly enchanted by the exceptional beauty of the Stone Forest scenery, he wrote two Chinese characters “Shi Lin” (Stone Forest) to name the forest-like landscape. From these after, “Stone Forest” or Shilin became the formal name of this spectacular karst landform, and Long Yun’s calligraphy was later inscribed in a giant stone pillar – one of the most well-known symbols of the Stone Forest. It was also in 1931 that Stone Forest Park was established. Because of a long and typical scientific study, the various Stone Forests or pinnacle karsts have been identified with the understandings of its much greater evolutionary complexity.

(1) Stone Forest and other landform

Within the Park’s more than 300 square kilometer area and 500m altitudinal gradient, Stone Forests occurred as clusters or patches over the karst plateau topography. Based on topographical locations and associated with other karstic landforms, following typical
stone forest types can be classified within the park:

**Stone Forest occurred on depressions:** Many stone forest clusters occurred in karst depressions where surface water and groundwater concentrated and connected. Within the depression stone pillars densely distributed on both bottom and slope. On the depression center there is often a window of subterranean river, and some stone pillars are standing on the water. Major Stone Forest, and Liziyuan Stone Forest, are good examples of this type of stone forest.

**Stone Forest occurred on hilltops:** Stone forest clusters occurred right on hilltops or mountain ridges like the case in Mt. Wenbi, Gaoshitou and other hilly areas in the southern part of the park. Usually the clusters are composed of sparsely distributed residual stone pillars. These locations previously were high in hydrodynamism.

**Stone Forest occurred on karst valley:** In regards to Wangchengshan, Heiqingtou and Daqingpo where stone forest clusters occur on a valley slope and bottom. Usually on the valley bottom there are springs or subterranean river windows, showing favorable hydrological conditions

**Stone Forest occurred on hill slopes:** Typically in the southern hill county, stone forest clusters occurred on some hill slopes. If one slope is occupied by a stone forest from top to bottom, there will be many tiers, showing the stone forest “generation”, older stone pillars on upper slope and younger ones on lower slopes.

**Stone Forest occurred on isolated hills:** In the north-central area of the park, long term erosion and solution have moved fractured rock, and relatively intact rock blocks remained as isolated rocky hills. Usually residual stone pillars stand on hilltops.

**Stone Forest occurred on basins:** In the flat northern area, such as in the vicinity of Beida Village, there are sparsely distributed stone forest clusters. Like isolated rocky hills, they are also the result of long periods of erosion.

(2) Morphological features of the Shilin

With Comparison to other remarkable pinnacle karsts in the world that were usually dominated morphologically by one main shape, Shilin National Park preserves and displays a most abundant morphological diversity. Almost all existing pinnacle karst types can be identified in Shilin, which makes its claim as the museum of pinnacle karst.
Individually, a stone pillar or column may take the shape of a needle, fin, spire, mushroom, or whatever unique shape. Collectively, stone forest clusters represent the following four major shapes:

**Pinnacle-shaped Stone Forest:** Developed mainly in thickly-bedded Maokou pure limestone, displaying typical pinnacle karst feature as other celebrated pinnacle karsts in the world such as the Bemaraha of Madagascar and the Mulu of Malaysia, etc. This type of stone forest is characterized by a sharp blade fretted with typical rillenkarren and honey-comb karren. The Major and Minor Stone Forest are good examples in the park.

**Column-shaped Stone Forest:** Largely developed in dolomitic limestone, since the rock is lithologically uneven and more resistant to weathering than pure limestone, stone pillar usually lack sharp spire and edge, Yingpan, Douhei, etc. are typical representatives of this type.

**Mushroom-shaped Stone Forest:** Developed in both dolomitic limestone and limestone, when a stone pillar is made from medium-thin bedded rock and suffered basal solution or collapse due to the gravitational effect, the pillar then takes mushroom shape. Wannianlingzhi and Naigu are ideal sites for this kind of stone forest.

**Pagoda-shaped Stone Forest:** mainly occurring in medium bedded Maokou limestone, when severe solution takes place along a bedding plane and nearly separates the rock horizontally, the pillar takes a pagoda-shape and looks like a pile of balanced stones. Akaoyi and Suoyishan are the best examples of this type of stone forest.

(3) **Rock surface solution feature**

In addition to the macro-karst – stone forest and stone teeth, a wide variety of micro-solution forms occurred on the rock surface such as karrens, solution grooves, solution holes, solution pans, solution slots, solution channels, etc. Lithological property controls an obvious rock surface solution; in general, a surface solution of dolomitic limestone, because of inhomogeneity, is more ragged than that of pure limestone.

Various solution surface patterns are not purely beautiful pictures contributing to the appeal of the park, but also important imprints reflecting upon subsoil, subaerial, and biological solutions suffered by the rock. For many stone pillars, the upper part are fretted with vertical karren, or rillenkarren which is obviously the result of subaerial solution by
rainwater, and the lower part are characterized by horizontal grooves or channels, which is
the result of subsoil solution by groundwater. The tiny solution holes and pits are the work
of likens

**(4) Outstanding universal values in term of geology and geomorphology**

Through comparison with other celebrated similar karsts in the world, following
conclusions can be drawn for Shilin National Park:

- The park is the only area in the world that preserves and displays Shilin karst
  landform or pinnacle karsts developed over the last 200 million years;

- Compared to other stone forests in the world, the park is unrivalled in the
  multi-phase complexity of its evolution from the middle Permian epoch to the
  present;

- Pinnacles in the park display greater morphological variety in regard to individual
  features than anywhere else;

- Stone forest and associated various other landforms constitutes an integrated karst
  landform system and provides an excellent example illustrating various karst
  processes.

2.1.2 Aesthetic values

The park displays unique natural beauty and is of great aesthetic value. Because of its
rich morphological diversity, the unrivaled natural beauty displayed by Stone Forest has
long been praised in China. The well-known Chinese painter Mi Fu (1051-1107) has
summarized the strange beauty of the stones in four words, i.e. “thin, wrinkled, holed, and
penetrated”, and Stone Forest is complete in all aspects of beauty. Everywhere in the stone
forest there are odd rocks, which rarely exist in many other famous mountains in China.
Stone forest is a marvelous spectacle created by nature and its rock-shapes are more
beautiful than the pictures painted by painters and more attractive than the rockeries
forged by garden-makers. Stone Forest is the natural model of the Chinese rockery-making
art, the natural example of the traditional Chinese painting and an inexhaustible source of
inspiration for painters and garden-makers.

The assemblages of the odd rocks in the Stone Forest are countless and varied. There
are single-shaped models such as “Stone Elephant” and “Stone Camel”; double shaped
models such as “Two Birds Feeding” and “Mother and Son Traveling Together”; two spectacles of one stone such as “A Camel Riding on an Elephant” and one spectacle of a collection of stones such as “the Stone City”. There are two rocks snuggling up to each other like two lovers meeting after a long separation and one rock towering aloft among a group of rocks like a herdsman tending sheep. In the Major and Minor Stone Forests the closely spaced rock-pillars, which are only 2~5m apart, provide a wide vision to visitors who may relax their tense mind and feel carefree and content while walking among them. The change of rock combinations is unlimited. Thus it is serving as a reference to any aesthete.

The sheerness and magnificence of the Stone Forest doesn’t exist in height or size, but in a breathless thrilling. The ‘Sword-blade rock’ sits on a small stone, and “A Critical Situation” looks so dangerous as if the rocks may fall. This is dangerous in a visual sense. To climb up and down the “Lotus Peak”, one seems to sit on a mountain of knives and swords. This is the danger experienced by the mind of the tourist. Stone Forest impartially distributes this beauty regarding danger, i.e. the danger of an object and the danger in the feeling of the subject. Stone Forest is a theoretical treasure house of aesthetics.

Stone Forest’s beautiful wilderness contains the aesthetical principle of primitive nature. When you are personally on the scene, walking on the rock block, entering the rock gates, stepping on wild weeds and exploring secluded woods, you will find everything fresh and new, singing birds on the rocky hill, densely-dispersed precipitous rocks, whiffs of a mountain breeze and sweet flowers, an intensely wild smell of the mountain bringing you back to remote primitive times. Only that state can help people build up the artistic conception of the natural beauty of the wilderness.

Most of the scenes in Stone Forest are not named, which not only has kept the inherence of a wild nature beauty, but also leaves as much room as possible for people’s aesthetic appreciation, letting them return to their childhood to hear the sounds of nature. In this sense, Stone Forest is a great teacher of aesthetics.

Quiet stone forests, murmuring streams, stretching mountains and mirror-like lades are in harmony with mother natures. Blue skies, white clouds, and green hills, and big rocks are in harmony with heaven and Earth. The outlines of stones, hills, lakes, ponds,
green and black, white and brown are in harmony with shape and color. Birds singing in
the woods and flowers blooming all over rocks are signs of harmony between human
beings and their surroundings. Lastly the national myths and legends, the rock inscriptions
and poems are an integral part of nature in Stone Forest.

2.1.3 Cultural landscape value

The Sani people, a branch of the Yi nationality, are the dominant minority group settled
in the stone forest area. There has been a long-standing relationship between human
society and the Stone Forest landform. Partly because of the low local relief and
positioned well for easy transportation between Yunnan and its neighboring eastern
provinces, not only agricultural civilization has been developed in the Lunan basin but
also a distinctive relationship between the native people and the karst landform has been
established through its history.

Through a long human history, the Stone Forest landform has been endowed with a
rich ethnic cultural context, the Yi nationality, particularly the Sani people, has helped to
develop their colorful customs in the Stone Forest area. Stone Forest deeply influenced
cultural and living concepts of Sani people of the Yi nationality. It encouraged the
formation of an ethnic culture and became the symbol of the spirits of the Sani people and
at the same time the representative of their physical lives. Because there is an obvious
linkage between the culture and Stone Forest, the culture has been regarded as a “stone
culture” or a “Stone Forest culture”. Folktales, poems, housing styles, festivals and
celebrations all exhibit the long historic connection with Stone Forest. The epic
“A-Shi-Ma” enjoys great popularity. The lively and bustling “Torch Festival”, the bright
and cheerful dance “Axitiaooyue” (dance to music), and the affectionate song “Guests from
afar please stay here” are known far and wide. Every stone pillar has its own story. All the
stone forests, the villages, the local housing, Mizhi Mountain/local “Dragon Mountain or
the mountains worshiped by local people” and Mizhi forests, that is a forest preserved by
local tradition, ponds and springs, red earth, and the pastoral lands recorded the lives of
the Sani people. All of them embody the supreme principle of Chinese aesthetics, i.e.
integrity combining the natural with human being.
2.1.4 Water resource and headwater catchments

Currently the surface and ground water of the park and the adjacent Lunan basin constitute a typical karstic water system, featuring a typical local plateau drainage area and not only does it demonstrate the interrelationship between water and karst landform in the period since at least early Tertiary, but also being a significant headwater for local people. The park is located at the mouth of the Ba river and the upper part of Lunan Basin. Its water quality directly dominates the water quality of the locally used water. With a total amount of $2.72 \times 10^8$ km$^2$, the abundant surface and underground water in the Park takes up 47.9% of the water reserves for the county, of which the underground water reaches $0.91 \times 10^8$ km$^2$, taking 33.4%.

2.2 Land Tenure of the Park and the Impacts

Shilin National Park is the home of the Sani people. With Paleolithic relics, the inhabitant history can be traced back to 300 B.C. There are over 50 villages, located around the karst ponds, karst lakes, the higher levels of riversides, the intermediate belt between karst mountainous areas and the Lunan basin. The population density exceeds 20 person/km$^2$. The main economic income generates from agriculture. And the proportion of farm cropped lands overruns 70% of the farmed lands. Although ratio of farming land is made up of nearly 40% of the area of the park, the farmland in the Core Zone is small. The area of forests, zonal vegetation and planted forests, and scrub land covers over 36% of the total area of the Park. Even so, there still exist threats to the outstanding Shilin Karst and its integrity from the land development, including the local tourist industry, in peripheral areas. Although long agricultural activities have not damaged the valuable Stone Forest, and created significant living and productive styles with harmonious effects of the local karst environment, a special integrity of agriculture, grazing, villages, vegetation and the Stone Forest, serious phenomena are occurring from grazing and farming in the Buffer Zone. As well as those in the Proving Zone/Tourist serving zone with protected farmland have evidently invaded into the Core Zone, and at the same time, some producing activities, such as the tourism industry, mining and infrastructure construction, also have been /are being the serious or potential impact on the naturalness of Stone Forest. The increase in the population and living costs in the
periphery of the Core Zone, and the increased productions, such as farming and grazing, and other land development, with more waste, overrun the environmental-bearing capacity of the circumjacent area of the Core Zone, and more seriously is extending to the Core Zone.

2.3 Tourist industry in Shilin Park

Stone Forest, because of its geographical uniqueness and exceptional natural beauty, has long been a tourist attraction. Pioneer tourists and adventurers explored part of the park area in as early as the fourteenth century (Yuan Dynasty), leaving many descriptions, poems, and inscriptions praising the marvelous natural landscape. In 1931, the Major Stone Forest of the park formally became a public park, and in 1982 it was designated by the state government as a national park and in 2001 as a national geopark. Stone Forest has become one of China’s major tourist attractions. Tourism highlighted by the stone forest has become one of Shilin County’s pillar industries, and “Stone Forest” has become a big name far beyond academic field. The number of tourists increased frapidly by then, which exceeded 1,000,000 in 1988 and 2,000,000 in 2004. The main tourist activities are for sightseeing and scientific purpose tours and at the same time for holiday, health, folk and eco-tourism products. The significant tourist spots in the park include Major Stone Forest and Minor Stone Forest, Naigu (black) Stone Forest mixed with Sani folk arts, and other spots such as Grand Waterfall and Lake Changhu. Of these sites, about 95% of the tourists choose Major Stone Forest and Minor Stone Forest, and 95% of them are one-day sightseeing trips.

Domestic tourists always choose stone attractions as their first choice, followed by folk cultural attractions, caves, environment, local history, vegetation attractions, and pools and lakes. The favorites are items with natural beauty or vivid cultural contents. Interestingly, the main attractions for international visitors are listed in order by stone attractions, lakes, vegetation attractions, folk cultures, caves and local history and they prefer folk art tour activities and the intact attractions of stones, waters and vegetation the most. The first choice of both the international and domestic tourists, the stone attractions, reflects the values and the correctly identified protection objectives and their significance in the park.
The tourist development of the park has brought various impacts on its values, both negative and positive:

(1) Providing the necessary funds for protection and research

(2) Effectively displaying the earth heritage, the scientific and aesthetic values, of which are not only well known in the earth scientific field, but also with the public

(3) Promoting the protection of local biodiversity together with protecting the stone forest

(4) Promoting the development and renaissance of the local culture, such as the Sani culture

(5) Diminishing the load from land development and creating new ways for regional social and economic sustainable development

(6) Meanwhile increasing the burden on the karst environment and sanitary facilities because of an increasing numbers of tourists

(7) Reducing opportunity for restoring local vegetation because of using too many exotic species for revegetation and landscape gardening as well with the Sani culture impacted because of an exotic culture

(8) Impact on the wilderness and naturalness of Stone Forest and the circumstance of traditional rural landscapes because of an increase buildings and architectures

(9) Impact on some geological heritages, geological landscapes and the karst hydrological systems because of mining and quarrying limestone or special marble in the periphery areas.
3. Directions and Strategy of Management of Shilin National Park

The key goal of the management of Shilin National Park is to effectively protect its outstanding universal values and demonstrate them. The chapter outlines a strategy of management for the realization of the goal on the base of the revised Master Plan of Shilin National Park (2004-2030) and for applying Shilin National Park to the inscription on the list of the World Heritage.

3.1 Protection of the Outstanding Values of the Park

Since issuing the Rules of the Lunan Shilin Park in 1991, the zoning of the park has been carried out on the base of Interim Articles of the Management National Parks of the P.R.C issued by the State Council in 1985. Its revised Master Plan (2004-2030) has defined four zones on the distribution of Shilin Karsts and their integrity in 2004.

**Specially Protected Zone:** Including Naigu Stone Forest, Wangchengshan-Qingshuitang Stone Forest, Wenbi Mt.-Suoyishan Stone Forest, covering a total area of 45.02km². The Special Protected Zone is largely in a pristine state and under absolute protection, without any man-made buildings inside, entry is prohibited except for scientific study. This zone, meanwhile, is also ecological protection area, a special scenic area and/or an important geological site.

**The First Class Protected Zone:** Including some important Stone Forest clusters and scenic spots such as Major Stone Forest, Minor Stone Forest, Long Lake, and Grand Waterfall, covering 69.9km². Within the first class protected zone, there are necessary track and limited tourist facilities, but automobile are prohibited.

**The Second Class Protected Zone:** Immediate peripheral area of the first grade protected area, covering 121.61km². Serving as the buffer area of special and first grade protected zone, this area contains some tourist and accommodation facilities, but non-tourist related facilities and automobile are restricted.

**The third Class Protected Zone:** Outermost and boundary zone of the park, covering 113.46km². This zone serves as the coordinating area of the whole park and delimits the boundary of the Park, within the zone construction and facilities are under control and must be in harmony with the nature of the park.
With the management ends of the various protected zones with its values, some potential threats have been found out.

(1) The specific protected zone and the first class protected zone:

- **Naigu Stone Forest**

  **The values**: The model place of the unique dolomitic limestone Shilin karst, key relics of the Shilin karst’s development, underground hydrological systems, the relationships between Shilin karst and caverns, subterranean rivers, the superlative natural beauty of black Shilin karst, the local important cultural attractions, and headwater of local key the Ba river.

  **Situation of Protection**: the Core Zone, Buffer Zone, and Proving Zone/Tourist serving zone were chosen with protected farmland, and patrol inspection, reoccurring of endemic vegetation, the Shilin karst landscapes and geologic relics are well demonstrated.

  **Potential threats**: Sporadic farmlands, continual deforestation, some exotic species from replanting and some invasive species, frequent farming and grazing in surrounding areas, and influenced underground waters.

- **Major Stone Forest and Minor Stone Forest, Liziyuan Stone Forest**

  **The values**: Classic model of superlative Shilin karst developed in pure limestone, various vivid stone pillars and fine relics of the Shilin karst evolution since the middle Permian epoch and dynamic process, typical Sani village and ethnic attractions, water catchments areas in the underground river.

  **Situation of Protection**: t the Core Zone, Buffer Zone, and Proving Zone/Tourist serving zone were chosen with protected farmland, patrolling inspection, Shilin karst well displayed; zonal vegetation restored.

  **Potential threats**: Overrun tourism; too many large buildings and tourist infrastructure; dense tourist route nets; influenced waters; impacted karrens; sweeping exotic species and invasive species; and sporadic farmlands, grazing.

- **Qingshui Pond-Shixiangzi Shilin karst**

  **The Values**: Rich relics of Shilin karst evolution and diversified Shilin karst, typical wilderness and the naturalness of Shilin karst, various vegetation and catchments area of the local reservoir and underground rivers.
**Situation of Protection:** the Core Zone, Buffer Zone, and Proving Zone/Tourist serving zone were identified with protected farmland, and patrolling inspection.

**Potential threats:** land-tenure of both collectives and individuals, farming, grazing and deforestation; quarrying and economic forests planting; invasive species and poor living facilities in rural communities nearby the zones.

- Wenbi Mt.-Suoyi mountain Shilin karst

**The Values:** Various Shilin karsts developed from both dolomitic limestone and limestone ranging from 1900 to 2300 a. s. l.; wilderness and the naturalness of the Shilin karsts, remnants of zonal vegetation and ethnic villages.

**Situation of Protection:** the Core Zone, Buffer Zone, and Proving Zone/Tourist serving zone were chosen with protected farmland and patrolling inspection.

**Potential threats:** land-tenure of both collectives and individuals; farming and grazing, and deforestation; invasive species; quarrying and economic forests planting; over-cultivated land, poor living facilities in rural communities nearby the zones.

(2) **The second class protected zone**

**The values:** the Shilin karst and the relics of Shilin karst’s evolution out of the Core Zone, the significant hydrologic attractions and headwater of the river and underground rivers, the local vegetation.

**Situation of Protection:** Identified Shilin karst attractions, specified requirements for vegetation protection, and local customs for protection of the Mizhi forests.

**Potential threats:** Over-farming, grazing and deforestation; various construction projects which would change karst landforms; exotic and invasive species; agrochemicals and pesticides; human waste; a poor infrastructure.

(3) **The third class protected zone**

**The values:** important hydrologic attractions, headwater and evolutionary relics of the Shilin Karst out of the buffer zones as well with some of the geologic relics and local vegetation, and cultural attractions.

**Situation of Protection:** Identified hydrologic attractions, headwater, Stone Forest attractions, vegetation, cultural and historic relic.
**Potential threats:** intensive farming, grazing and deforestation; various construction projects (architecture construction and roadway construction); exotic and invasive species; poor infrastructure; quarrying and mining.

**3.2 Developmental Direction of Shilin National Park**

The developmental direction of the park encompasses the following: firstly zoning and classifying; and secondly realizing the functions of the zones, and finally conserving and increasing the values of Shilin National Park with sustainable use of the stone forest.

**3.2.1 Zoning and Defined Functions**

The area of the park was divided into three zones (Tab.3-1): the core zone which is part of the South China Karst World Heritage Nomination, Buffer Zone, and Proving Zone/Tourist serving zone with protected farmland. The functions of various zones are identified as the following (Fig.3-1).

**The Core Zone:** The highly protected part of Shilin National Park. Protection here focuses on the outstanding Shilin karst, evolution’s relics, the evolutionary model of stone forest and its integrity with zonal vegetation. The core zone includes the Naigu Shilin karst, Major and Minor Stone Forest, Luomadong Shilin karst, Qingshui Pond-Shixiangzi Shilin karstand, Wenbi Mt.-Souyi Mt. Shilin karst.

**The Buffer Zone:** it refers to the periphery of the core zone as well as with Changhu Lake, and the Grand Waterfall. The functions of the buffer zone are to provide a buffer space to prevent the stone forest, geologic relics, vegetation, and naturalness in the core zone from the impact of human activities. In addition to that, it will keep the integrity of the natural and aesthetic attractions; preserve the wholeness and continuity of the Karst hydrological system and water reserves in the Shilin National Park, and at the same time protect the typical stone forest attractions and other evolutionary relics outside of the Core Zone, and other karst and aesthetic attractions.

**The Proving Zone/Tourist serving zone with protected farmland:** Located outside of the Buffer Zone, the Proving Zone/Tourist serving zone with protected farmland includes the second-class protected zone and the third-class protected zone. Its functions are to reduce the impact of human activities on the Buffer Zone, protect the stone forest,
the geologic relics, the local vegetation, and the cultural attractions in the Ba river drainage area. Generally, it is important to protect the integrity of the stone forest and its relics of evolution.
Fig. 3-1 Schematic Map of Zoning of the Shilin National Park
### Tab. 3-1 Zoning of Shilin Park and Heritages Spots

<table>
<thead>
<tr>
<th>Zone</th>
<th>Names of Heritages Spots</th>
<th>Values</th>
<th>The Part of the Park</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Zone</td>
<td>Naigu Stone Forest, Baiyun Cave, and subterranean rivers</td>
<td>Typical Shilin karsts qualified for Criteria VII and Criteria VIII</td>
<td>Naigu</td>
</tr>
<tr>
<td></td>
<td>The Stone Forests respectively at Shuangjian Mountains, Fairy Lake, Gaoshitou,, Leidashi, Daoshitou, Wangchengshan, Shixiangzi , Grandpa expecting Grandma, Yingpan, Daqingpo, Laohuqing, Liuyingtang, and Shihuangu.</td>
<td></td>
<td>Qingshuitang - Shixiangzi</td>
</tr>
<tr>
<td></td>
<td>Stone Forest respectively at Wenbi Mt., Suoyishan, Dawanqing and their vegetation</td>
<td></td>
<td>Wenbi Mt. - Suoyishan</td>
</tr>
<tr>
<td>Buffer Zone</td>
<td>Stone Forest respectively at Hemo, Zhantun, Pudoucun, Heiqingtou, and Tuanjie Reservoir.</td>
<td>To protect the Core Zone and the integrity of Shilin Park and Structure of the Karst hydrologic system and water reserves</td>
<td>Naigu</td>
</tr>
<tr>
<td></td>
<td>Stone Forests respectively at Shangpucao, Heilongtan, Qingshuitian Village, Shuitangpu and Mizhi forests</td>
<td></td>
<td>Qingshuitang - Shixiangzi</td>
</tr>
<tr>
<td></td>
<td>Shujinshen Stone Forest, Douhei Stone Forest, and Geyihei Stone Forest.</td>
<td></td>
<td>Wenbi Mt. - Suoyishan</td>
</tr>
<tr>
<td>Proving Zone/Tourist serving zone with protected farmland</td>
<td>Stone Forests at Heishitou, Shibanshao, Sibeiou, Baozidong , Huoshipo, Ayilin, Majianshan, Shaorenchang, Daqingshan, Railway Station, Wanyaoshan, Guweishan, Stockbreeding field , Sanjia Village, and Daqing.</td>
<td>To provide the spaces for the integrity of the park and the attractions of Shilin cultures, and to protect scattered stone forest and geologic relics.</td>
<td>Naigu</td>
</tr>
<tr>
<td></td>
<td>Zhiyun Cave, Jibailong Cave, natural bridge, New Tourist Center, Stone Forests at Daxiao- Jianshan, and Jialianshan.</td>
<td></td>
<td>Major Stone Forest-Liziqing</td>
</tr>
<tr>
<td></td>
<td>Zumo Stone Forest.</td>
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<td>Qingshuitang - Shixiangzi</td>
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<td></td>
<td>Suoyishan Stone Forest.</td>
<td></td>
<td>Wenbi Mt. - Suoyishan</td>
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<tr>
<td></td>
<td>Lake Changhu and Grand Waterfall.</td>
<td></td>
<td>Lake Changhu, and Grand Waterfall</td>
</tr>
<tr>
<td></td>
<td>Stone Forests at Laohuangs and Laoguanshan.</td>
<td></td>
<td>The third class protected zone.</td>
</tr>
<tr>
<td></td>
<td>Qifengdong Cave, Lake Yuehu and vegetation, Huaishidu Stone Forest, Dalaowa Ponds, Mopanshan vegetation, and Sheshan Stone Forest.</td>
<td></td>
<td>The third class protected zone.</td>
</tr>
</tbody>
</table>
3.2.2 The Functions and Activities of the Zones and their boundaries

The Core Zone: Strictly conserving the naturalness and maintaining the natural state of Shilin karsts; prohibiting all construction activities, especially quarrying and difforestation; restoring the degenerative vegetation and artificial forest with a local species; forbidding hunting; eliminating invasive species; and prohibiting polluted water from entering into the zone, stopping farming and grazing for revegetation. The delimiters of the boundary lines between the Core Zone and Buffer One are based on the topography, hydrological structure and inner human activities, For example, the north delimiter from the entrance of Minor Stone Forest, through Natural Dancing Field and Lion Pavilion, to the west section of the Rounding Tourist Trail-entrance of Liziyuan and Mushroom Pillar; the west from Mushroom Pillar-Luomadong to Qingshuitang village path, and the South one from Qingshuitang village path to Laoyingtan, and the east from Laoyingtan through Daqingpo and Liuyingtang-sifangtang to Bushaoshan.

The Buffer Zone: Furthering up the protection of stone forest landscapes; conserving and maintaining the integrity of evolutionary relics and karst ecological systems; establishing basic trails and facilities for tourists and tourist service which could not do damage to the topography, landscapes and geological environment; protecting rural attractions; prohibiting deforestation, quarrying, hunting and extended farmland; strictly controlling grazing areas, and actively replanting and landscaping along the sides of roads and lakes. The inner boundary line of the Buffer Zone is with the Core Zone and the definition of its outer line depends on the integral structure of karstic relics, topography, and hydrologic units as well with human activities.

Proving Zone/Tourist serving zone with protected farmland: Coordinating space for the Buffer Zone and tourist-serving infrastructure; furthering up replanting, landscaping and environmental reconstructing; controlling of felling, quarrying and excavating soil; repairing all sorts of damaged sites; removing factories and some enterprises which would cause contamination; forbidding all kinds of polluted materials and activities, readjusting farming structures; and developing pastoral scenery. The outer boundary is the boundary of the 35000 ha of the park.
3.3 Strategy of Protection and Management

3.3.1 Scientific Value Protection

The scientific value of the Shilin National Park, which is the first item in regards to joining in the South China Karst World Natural Heritage Nomination, manifests in the Shilin karst and their natural and cultural attractions, mainly in the types of the Stone Forest, relics of their evolutionary history, modeling sites of Stone Forest’s development, the pattern of their distributions, and landscape identity. Protection should be based on strict identification of the quality of Stone Forest and carried out on zoning and classification as described in the 3.2 section with the following measures.

The concrete measures are firstly to protect the sites characteristic of global significance in the earth science by conserving their appearance, wholeness, complete relics of the evolutionary and the dimensional patterns, and secondly to maintain natural combination of the Stone karst with other elements such as geological structure, rocks, vegetation, soils, and superficial and subterranean hydrological systems. Both of these two methods should be carried out under the protection principles for those exposed geological sites and integral geological ones.

The exposed geological site refers to the geologic sections and attractions exposed by the natural processes or other ways. The main ways for protecting them are to keep their occurrence, and maintain the natural exposition of special types of stone forest. The integral geological sites mean the harmonious state of the Stone Forest with rocks, geological structure, hydrological system, soils, landforms, vegetation and local ethnic styles, any damage to any of these elements will decrease their quality. The ways for such sites are to pay attention to conserving and maintaining the coordinating state of all elements free from damage and biological invasion. From this the realization of a coordination of geological diversity to biodiversity is made with splendid landscapes within the stone forest.

3.3.2 Aesthetic Value Protection

The aesthetic significance of Stone Forest, which is another factor for joining in the South China Karst World Natural Heritage Nomination, is the splendid shapes and the dramatic structure of the stone forest as well as with a background of typical subtropical
karst red plateau and wonderful Sani culture. The stone forest is reputed as the natural model of Chinese Classical garden art.

The aesthetic values of the stone forest are protected together with its scientific values including naturalness, diversity, uniqueness, integrity and dependency. The area for tourism should be kept free of any obstacles that interfere with human activity. Generally, the exposed landscapes should hold its openness and convenience for visiting and studying, and be accompanied with nice and suitable vegetation from the local species, such as the suitable composition of trees, bushes, liana and grass together with the controlling of sizes, types and buildings; and protecting algae on the surface of rock. The integral landscapes should be protected as with the wilderness including natural bodies of water, seasonal scenery free from invasive species and poor construction. Attention must be paid to protecting and restoring local fauna and flora.

3.3.3 Hydrology and water reserve protection

The main contents for protecting the hydrology and water reserves in the park include the headwater and catchments of Ba River, and the complex systems of underground rivers. The hydrogeological relics in the Park are an important part of the scientific values of the stone forest, which express the dominating factors of stone forest’s evolution, such as surface and underground water system, solution basal level, caves, windows to subterranean river, springs, and ponds. From the view of water reserves, surface and underground water distributed in the park is basic for the water resource of the Shilin County as catchments of the Ba River and Heilongtang reservoir which provides nearly 75% of the water needed for the county.

Their protection should be carried out from points, lines to areas with recording the sites of hydrologic relics and bodies of water in the Core Zone, Buffer Zone and Proving Zone/Tourist serving zone with protected farmland, and combined with protecting the natural scenery, local vegetation and recovering of climax communities around the sites, trying to cultivate suitable hydrologic conditions for artificial waters, with no use of chemicals in the headwater areas.

3.3.4 Cultural Landscape Protection

The cultural landscapes are complements of the scientific and aesthetic values of the
stone forest, and also an important part of the tourism industry in Shilin County, which is
good for rejuvenating and advocating the local ethnic culture, for example of the Yi
nationality, in the park’s region.

The Shilin cultural landscape generally refers to an integration of complex and
traditional settlements, the life styles, and folk arts of the Sani people of the Yi nationality
born in the stone forest area, such as slabstone house, red earth house, Mizhi mountain
and Mizhi forests (local worshiped hills and forests), springs, farming, grazing goats
and cows over the stone forest field, ethnic costumes and cuisines (Sani, Axi, Baiyi, and
Heiyi of Yi), ethnic folk arts and sports (wrestling, bullfighting, and the Torch Festival),
and religions and nature worships (totem and procreation worship) as well as the
embodied ideas of ecologically controlling and producing. The best way for preserving
them is to popularize and develop them.

For traditional settlements, it is suggested to keep their appearances and modernize
the interior with an improved rural infrastructure, to advocate the traditional knowledge
of biodiversity protection and water protection, strictly to preserve remnants of zonal
vegetation existing in Mizhi forests, to ameliorate rural infrastructure by creating and
maintaining the coordinating styles of traditional settlements to modern architectures
with natural beauty, to strengthen water protection and landscape restoration, to develop
folk tourism and eco-tourism, and to readjust family energy structure to reduce felling, to
readjust a growing structure in rural villages for both increasing output of crops and a
good environment for the local tourist industry, and to control soil erosion, to change the
styles of nomadic grazing with rules of environmental capacity and combining of feeding
in a pen with in the field in order to restore local vegetation.

Besides those, the nature worship sites found in the park should be in situ protected
with marking and improving the environment. For ethnic costumes, cuisines, folk arts
and sports, it is advised to keep and develop, and nominate as non-substantial cultural
heritage if necessary. At the same time, creating the atmosphere for admiring folk artists
and promoting the learning of their skills by developing them into special tourist
attractions are very important.
3.3.5 Biodiversity Protection

Protecting local biodiversity is also equally crucial to protecting the stone forest and the environment in Shilin National Park. The idea that local biodiversity and endemic vegetation are the identity of the park should be kept in mind. The key items of local biodiversity are the local climax vegetation or zonal vegetation such as *Cyclobalanopsis glaucoides* forests, *Cyclobalanopsis delavayi* forest and *Castanopsis delavay* forest and *Quercus coccifera* forest, *Quercus franchetii* forest, and rare and endangered species such as *Psammosilene tunicoides*, *Toona iliata var. pubescens*, *Calocedrus macrolepis*, *Neocheiropertris palmatopedata*, *Nouelia insignis*, *Zelkova schneideriana Han.-Maz*, *Paeonia delavayi var. lutea*, *Ottelia acuminata* and other local protected species, and some other local cavern creatures and soil animals such as *Boysidia shilinensis*, *Formosana lunanensis*, *Triplphysa shilinensis* Chen et Yang, and *Sicocyclo-cheilus macrocephalus* Li, *S. oxycephalus* Li, *S. lunanensis*, *Anabariliu golden-linus* Li et Chen. Because of the fragmenting of zonal vegetation and intensive disruption from human activity, lots of local animals and birds disappeared, and the opportunity such as the habitat and dispersing of local species propagula for reappearance of local vegetation are very weak. So, attention should be paid to creating a basis for the ecological restoration and landscape restoration. The main measures are the following:

- protect forests and green-lands according to laws and regulations, develop local techniques for biodiversity protection, and pay attention to developing the tradition, ideas and significance of Mizhi Mountain and Mizhi Forest
- strictly conserve remnants of local climax vegetation scattered in Mizhi Mountain and promoting the recovery of local vegetation in the park by effectively closing natural evolution
- make full use of the park’s protected status to promote restoration of local vegetation both in natural evolution and by replanting local seedlings collected and bred in the park’s eco-region
- set up the networks of local vegetation by afforestation along the roads and in other public green-lands for building up the local species’ reservoir and dispersing banks
- gradually readjust the rural family’s energy structure and reduce felling for deforestation
- monitor water quality and prevent the park from polluted water
- control exotic species and eliminate invasive ones
- allocate the special area outside of the Buffer Zone for centrally developing economic forests and to control them in natural forests, especially in the climax vegetation
- construct methane ponds in rural areas as a substitute to firewood

3.3.6 Demonstration of Shilin National Park

The effective demonstration of values of interest in the park is the best way for protecting the stone forest and the realization of the sustainable development, ecological and cultural, of the region which the park belongs to. The main ways for demonstrating are the following.

(1) The museum of Stone Forest

The museum can completely and systematically display the values of the park in ways, both traditional and modern, such as words and maps, pictures and sounds, three-dimensional animation and concrete modeling, interpretations and booklets, including:
- natural history and regional geology of the park
- the stone forest: types and shapes, evolution and relics, scientific and aesthetic significance, and modeling demonstration
- hydrological systems and water reserves in the park
- biodiversity of the park
- human history of local nationalities and their culture
- new ways for protection and sustainable utilization of the park’s resources
- displaying other Stone Forests or pinnacle karsts around the globe
- outline the future/prospect of the Park in both protection and development

(2) Books, albums, tourist maps and booklets, VCD and DVD

- heritages and their sites in the park and resources of the park
● ethnic cultures and cultural attractions in the park
● the ordinances and regulations of protection related to the Park
● touring and recreational maps in the park and the county
● natural history and wilderness of the park
● biodiversity of the park and outlines of ecological restoration
● publications about the Park, for example study of achievements, biological, and geological, cultural and historical
● a variety of VCDs and DVDs about the park

(3) Identification’s system, including:

● register stone forest’s trade mark
● promote the image of the park and demonstrate the identity of the Stone Forest, for example, hanging up the icons, such as National Park, National Geopark, member of UNESCO Geopark Network, National Top Tourist Scenic Area (4A Tourist Scenic Area), National Exemplary Area for Civilized Tourist, and etc.
● Zone’s identifying system, namely, introduction to Shilin National Park, maps of the heritage sites, and the brief look at the zones and cultural landscapes
● Delimiters of the various zones with clear descriptions and good plates made of sorts of materials suitable for the sign
● An signing system for spots of both scenic tourist and relics: marking those spots that well demonstrate unique values of the stone forest such as geological value, landscape value, biological value, and hydrologic value, and cultural and historic relics
● Identification for management and business in the park: signs for the management buildings of the park, staff uniforms, signs of the park administration’s property, patrolling signs, signs for donation and investments, icons of enterprises and business
● signs for tour guides and security, e.g. signs for tourist roads and trails, tourist spots, sanitary signs, traffic signs, emergency signs, security signs and tourist serving signs, supervising signs
● signs for tourist serving standards for guides, food and souvenirs, and
accommodation

(4) Signs for public promoting and marketing, referring to:

- signs for Internet advertising and marketing
- promoting signs with a variety of public media and advertisement hoarding
- window demonstration of the park’s development, scheduled and unscheduled

3.3.7 Management of tourist projects and tourist security

(1) Management of tourist projects

- all sorts of tourist projects, including proposals, must be controlled by the laws and regulations of the park and be consistent to the revised Master Plan of Shilin National Park
- all tourist projects must reach the standards defined in the Master Plans of Shilin National Park and Shilin World Geopark
- strictly control the sites of tourist projects and other business on the basis of the zones’ management
- The projects can not damage and spoil the ecological and cultural sustainability of the park

(2) Management of tourist security

- the Management Bureau of Shilin National Park controls tourist activities on the basis of classification and zoning management and environmental capacity
- provide and improve serial signs for tourist roads, tourist areas and tourist activities
- all tourist activities must meet the standards of the park management and can not conflict with local ethnic tradition
- The Management Bureau of Shilin National Park must be responsible for the security of all tourists and provide all posted warnings for the security of all tourists
- set up a network of monitoring security and patrolling which is in effect day and night
- improve the emergency system of the park with qualified staff, devices and techniques, money and regulations

3.3.8 Assessment and Management of all constructing and developing projects

The projects here refer to tourist service facilities, public infrastructure, local
housing’ construction, ecological restoration and landscape restoration. No matter which, from the government, enterprises and groups and individual, domestic and abroad, the projects and their feasibility must be assessed and proved not only in terms of benefits and values, but also in terms of its potential risks which may be serious to the park. So there must be strict standards and procedure for assessment, inspection of projects, which must correspond to national and local laws and regulations, as well as to international management practices.

(1) Assessing contents of construction and projects.
- impacts on the Shilin heritages, geological relics, landscapes and local cultures
- impacts on the natural beauty and attractions
- impacts on surface and underground waters, and hydrologic systems
- impacts on local biodiversity and the climax plant communities
- impacts on the stakeholders involved in the park and the protection of the park, especially on improvement of local communities, both farming and residential
- impacts on traditions and cultures
- carry out strict environmental assessment standards with a veto system for environmental impacts management

(2) The assessment system for construction projects
- inspection of assessment procedures for proposal of the projects, forms of relating units’ assessment, ordinances and regulations qualification, to integral consultation from stakeholders, experts’ arguments and public noticing, and follow-up
- assessment of the project plan; involved in public bidding of planning, plan assessment and public notification of the plan, and inspection by the units of interest in the government and legal censorships
- supervision of the project’s construction, including the public bidding for construction, material used, and construction progress and quality
- checking for acceptance of the constructed project; referring to the corresponding technique criteria, environment criteria, attraction criteria, and security criteria, etc.

3.3.9 Scientific Investigation and Monitoring

(1) Contents
According to laws and ordinances, and the revised Master Plan of Shilin National Park, monitoring and studying should be carried out in the park and the monitored items can be divided into three parts; namely, the situation and trend of the protected objectives, the change of land-used structure, and the environmental monitoring in order to provide the basis for improving the management of the park and set up the database of the park’s environmental change and protected objectives. The items involved are:

- Monitoring of geological relics and Stone Forest: quantity, distribution and natural appearance
- Monitoring of biodiversity: communities, populations and species, rare and endangered species, aquatic species, cavern creatures, soil animals, famous and ancient trees, habitats
- Monitoring of the dynamic tendency of the Stone Forest: solution ratio, carbon cycle, hydrologic condition including water level, runoff, and hydro-chemical indexes
- Monitoring of the environmental quality’s indexes such as atmosphere, water and soil
- Monitoring of the land-used structure, the chemicals used on farmlands and forests
- Analyzing of tourists and population change: quantity, places, consumption, interests and motivations
- Supervision of tourist service quality and management of complaints from tourists

(2) Setting up scientific investigation and monitoring networks:
- Fixed monitoring networks for karst kinetics, biodiversity, atmosphere, hydrology and tourist activities
- Database on the basis of GIS, RS, GPS
- Monitoring-and-patrolling networks from residents, social communities, town and villages, to the Management Bureau of Shilin National Park and local government
- Organization system of qualified units and staff for monitoring and controlling
- An improved and qualified system for assessing
- Supervising system to assess and monitor: supervising of monitoring, assessing, and analyzing of the monitored and assessed results and making predictions about the park’s development
3.3.10 The management organizations and educating and training of staff, including partners

(1) Management organizations

- set up management organizations and supervision systems matching Shilin National Park on the basis of the laws and regulations
- perfect the duty’s system and operational mechanism for all levels of management from the government of Shilin Yi Autonomous County, the Management Bureau of the Shilin National Park, villages and town, social communities, staff and all of its employees
- establish an efficient internal organs of the Management Bureau for Shilin National Park for effectively carrying out the duty system of the park
- improve the group of scientific and technical advisory and perfect technical aid system for the park management
- perfect the negotiating system for dealing with complaints and conflicts, among the related departments of the governments, the bureau, communities, enterprises and investors, local inhabitants and the qualified units
- reform the management mechanism and improve the conditions of the bureau to ensure the effective protection of the values and integrity of the park

(2) Management and educating and training of staff

- set up an efficient staff team qualified for carrying out the management of Shilin National Park in both professionals and specialists, and a 70% of the staff consists of professionals and specialists
- put into reality the responsibilities for each post and carry out a comprehensive quality management
- persist in the post’s management system consisting of the post qualification, post achievement, training in advance of taking post, scheduled post examination and on the post (job) training
- set up an efficient educating and training system for all of the staff from on-job training to off-work training for improving their posts’ ability
- edit a training text book about the values, protection and development of the park
from techniques to related laws and regulations, for both staff, local people and all of its stakeholders

- set up a mechanism for communicating experiences and skills, and discussing the park’s management

3.3.11 Financing the park and distribution of management resources

The resources for park management include professionals, fund and devices, information and land.

(1) Financing the Park

- funds and allocated lands from all-levels, the central government, provincial government, and municipal and local government, to the donation of persons, groups and enterprises
- income from the tourist industry in the park
- donated devices and volunteers’ service

(2) The distribution resources

- all the resources are distributed under the plan as a whole by the government and managed directly by the Management Bureau of Shilin National Park
- all of the resources must be controlled and partitioned by the Management Bureau of Shilin National Park on the basis of the reasonable mechanism accepted by all stakeholders
- the resources must only be used in the protecting, restoring engineering and monitoring, staff training, scientific popularization and education for the park
- strictly supervise the use of resources and improve self management of the Management Bureau of Shilin National Park with scheduled publishing of the resources to the public and the stakeholders

3.4 Construction of the Management Database

3.4.1 Contents of the database

- basic data of Stone Forest: types, location, relics, physical attributes, human activities (including land use), significance, situation of protection and development, land tenure
- basic data of geological relics: kind, location and geologic significance, physical
attributes, human activities (including land use), situation of protection and development, land tenure

- basic data of biodiversity: vegetation and area, list of composed species, location, icons and distribution, land tenure; rare and endangered species lists, location, distribution and icons; famous and ancient tree lists, location, icons and distribution; local plant communities including Climax plant ones, location and distribution, habitat; planted species records including names, place of origin, site, raising measures and occurrence, planting records of local species including name, distribution, collecting methods and sites, breeding and protecting measures

- basic data of hydrology and water reserves: water registering: river, lake, reservoir, spring, water channel with name, owner, location, attribute and catchment area, situation; water condition registering: history, physical attributes, human activities and development and protection; controlled water registering: distribution, quality, disposal and flow of the living and producing waters in Stone Forest; the hydrologic system registering of the park: names, distribution, origins, attributes, collection areas, physical conditions and human activities; and hydrology observing data: observing sites, contents etc.

- meteorological data: meteorological elements with time, analyzing reports, and meteorological disasters in history

- data of human geography: population and distribution, villages with names, sites, history, population and physical conditions, land types and area, and economic activities and capital income; and living conditions: traffic, houses, water resources, devices and family energy

- land-used structure: kinds, size, spatial distribution, owner and land tenure and user, land quality, soil erosion situation

- basic data of the Management Bureau of Shilin National Park: staff, real estate, financial affair, capital, investment and enterprises

- basic tourist data: number and structure, guest places, spatial and temporal structure of tourist activities, consumption, travel modes and preferences, tour guides, tourist facilities and recreation facilities, tourist infrastructure
• basic data of scientific investigation and study: project and sponsor, achievement including thesis, books, reports, plans and proposals, observing records, and researchers and groups
• basic maps: geological map, relief and landform map, geologic environmental map, aerial photographic image, satellite imagine map, landscape map, land-use map, vegetation map, population map, hydrological map, key resources map, rare and endangered map, famous and ancient trees map, etc.

3.4.2 Management Databases Types and Techniques
• literature and maps database: managing all word files, recorded data and maps, pictures
• supporting techniques from 3S techniques, namely the Geographical Information System, the Remote Sensing and the Global Positioning System, as well as Internet technology
• basic information database for management based on the 3S techniques: monitoring, recording, analyzing and assessing, and forecasting, and renewing new data
• constructed period, going into use before 2010
4. Management Plan of Zoning and Classifying

Shilin National Park will be managed on the basis of Zoning and Classifying. The Defined zones are the Core Zone, Buffer Zone and Proving Zone/tourist serving zone with protected farmland. The details of the zones mentioned above are in 3.2 sections.

4.1 Management Plan for the Core Zone

4.1.1 Definition and area

The Core Zone, which is nominated for South China Karst World Heritage Nominations and includes the Specially Protected Zone and The First Class Protected Zone defined in the revised Master Plan of Shilin National Park, contains all heritages of interest for protection with naturalness, uniqueness, integrity, diversity and beauty of the stone forest. There are fewer human activities and some patches of natural vegetation, especially patches of climax communities characteristic of subtropical karst plateau zonal vegetation with rich endemic species and dense forests. The area of the zone is 120.7 km², including four patches.

- Naigu Stone Forest
- Wangchenshan-Qingshui Pond
- Wenbi Mt.-Suoyishan with an elevation range from 1800 to 2203 m a.s.l
- Major Stone Forest and Minor Stone Forest.

4.1.2 Management measures

- fairly and justly readjust the land tenure and its management in the Core Zone for the purpose of effective protection of the relics in Shilin National Park in accordance with the laws and regulations
- combine legal protection with traditional conservation from local customs in order to maintain natural conditions for evolution of the local vegetation and stone forest
- perfectly preserve the geological relics and conserve the natural conditions and the diversity of Stone Forest with local biodiversity in the park
- prohibit construction and production, such as mining, quarrying, felling, and avoid fire disasters
- create habitats suitable for the evolution of artificial forests towards to local
vegetation with specially fostering and replanting of local seedlings

• forbid illegal hunting and polluted water in the zone

• allocate the lands for monitoring and studying and limit the number of people allowed into the zone

• strictly control transportation and prohibit certain motor vehicles and animal-driven carts
4.2 Management Plan for the Buffer Zone

4.2.1 Definition and area

The Buffer Zone refers to the peripheral areas of the Core Zone together with Lake Changhu and Grand Waterfall spots, including:

- Northern boundary and part: from the north to Hemo Stone Forest, south to the Nanning-Kunming Railway Road, east to the Ba river, and west to Pudou Stone Forest
- Southern part and boundary: from the north to Lufang Pond and Shuangtangzi Pond, south to the Suoyishan, east to Shuitangpu-Suogeyi road, and west to the border of the special –class protected zone; involving Major Stone Forest and Small Stone Forests, Bushaoshan Stone Forest, Geyihei Stone Forest, Shihuangniu Stone Forest, Tiankonglin Stone Forest, etc.
- Lake Changhu: with the north to Zumo Road, south to Shuangjian Mountains, east to Xiaotuanshan, and west to Jiuxiang-Shilin-Aluguodong Road; including Mopanshan Fengcong, Lake Changhu, and Dushishan fengcong
- Grand Waterfall: comprising Ba river, Dakehe River and Qingshuihe Valley

4.2.2 The Measures of Management

- strictly protect the natural conditions of Stone Forest and prohibit any activities which would damage the landforms and relief, except for building those basic tourist walking routes and sightseeing facilities
- prohibit the construction of any facilities that are of no interest to sightseeing, and control the amount of motor vehicles allowed into the Zone
- control those facilities which would spoilt the beauty of Stone Forest and its wilderness, and keep in mind those who just want to experience Stone Forest
- Landscape the sides of transportation routes such as roads and railways with seedlings, local and nice exotic, for both attractions and dispersing corridors of local species
- strictly confine expansion of rural housing and maintain the traditional styles of architecture while improving rural infrastructure
- restore the natural environment of water reserves by returning the farming land and
grazing land beside the waters to vegetation

- forbid felling, mining and quarrying, illegal hunting, and protect the zone from fire disasters
- control sewage
4.3 Management Plan for the Proving Zone/ Tourist Serving Zone with protected farmland

4.3.1 Definition and area

Proving Zone/Tourist Serving Zone with protected farmland, outside of the Buffer Zone, includes part of the second-class protected zone and the entire third-class protected zone for reducing the impact on the Buffer Zone and protecting the important geological relics, the local vegetation, significant cultural attractions as well as water reserves with a total area of 135.73 km², including Shilin Town, Beida Village, Weize Village and Lake Yue and other places of importance.

4.3.2 Management measures

- all buildings, construction and tourist facilities should be characteristic of the local nature and history, and no interference with the natural beauty
- reinforce asforesting and improve the environment, and construct domestic energy bases and control the use of chemicals
- prohibit all activities which will do harm to attractions, the environment, geologic relics, water and local vegetation; and avoid fire disasters
- reconstruct damaged lands with local plant communities and some exotic species adapted to the Shilin region
- promote scientific and techniques and make full use of local skills for protecting biodiversity and water reserves; develop distinctive agriculture, forestry and animal husbandry by readjusting planting and raising structures with pastoral restored landscapes
- speed up construction of the rural infrastructure and improve environmental sanitary conditions in village and towns, control human wastes

4.4 Management on the classification protection

4.4.1 The protection of the landscapes and geological relics/sites

The landscapes defined here refer to all stone forests, stone teeth field, hills and depressions, fengcong, waterfalls and caves in the park. The geologic relics defined here are those relics of the stone forest’s evolution, geological events, hydrogeology, including strata, fossils, geologic structures, ect. All of those demonstrate significant of interests in
the park. And therefore, it is necessary to carry out strict protection. The main measures include:

- prohibit quarrying and excavating, and carry out an efficient way to avoid fire disasters
- prohibit transporting of the stone pillars to places outside of the park
- return farming and grazing lands to vegetation and control the use of chemicals in the following areas: the peripheries of Stone Forest with the range of one time stone pillar’s height, the range of 100 meters away from Stone Teeth field and fengcong, and the catchments areas of the underground rivers.
- encourage using local species for afforestation and promote natural restoration of local vegetation with suitable artificial aids
- publicize the lists, plans, skills for protecting Stone Forest, geologic relics/sites, species and vegetation with the prospects of Shilin National Park

4.4.2 Protection of ethnic cultural attractions and local plant communities

The ethnic cultural attractions refer to those characteristic of local history, customs, arts, religions, living ideas, and relics of the Yi nationality in the park, including traditional housing, architectural styles and materials used, costumes, arts and crafts, spoken and performing arts, festivals, producing styles and tools, and nature worship idols. The local plant communities refer to those vegetation characteristic of habitats of the Shilin region, especially those climax communities in Mizhi Mountain. The measures of protection are:

- publicize the ethnic cultural relics in the park with signs marking sites and significances and the protection required
- rationalize the local producing structure for the park and help wealthy locals with enriching the local cultural tourist products from folk song, dancing performances, folk arts and crafts to ethnic rural tourism, eco-tourism, cuisine tourism, etc.
- publicize the lists and icons of the places of the Mizi Forests, local climax plant communities, rare and endangered species, famous and ancient trees with cultivating techniques, as well as invasive species and their distribution and possible negative impact/danger
combine the protection of the local architecture styles, the settlements, and surroundings with improving the infrastructure and sanitary facilities in rural areas

keep in mind that any new construction and buildings should be in harmony with the integrity of the park and local traditional architecture; and the materials used for decorating the outer architecture design of the buildings and construction should not spoil the surroundings of the zone

strengthen managing of raising livestock, both in nomadic and in the pen, and to protect waters and water scenery in villages

make and publicize the plans and strategies for rejuvenating local ethnic cultures and restoring local vegetation with prospects of the villages and towns in mind

4.4.3 Protection of Waterscapes and Hydrographic Relics

Lakes, waterfalls, reservoirs, the Ba river, subterranean rivers and karst springs are included here and the main measures for protection are the following:

- Marking the characteristics and significance of each attraction and relics
- preserve the natural beauty, and control soil erosion around all water, and carry out plans for ecological restoration and landscape restoration with the main goal of restoring local vegetation and integral structure of hydrological systems
- prevent the park from pollutants
- coordinate necessary building and architecture with the waterscapes and natural conditions

4.4.4 Restoration and Protection of Landscapes beside Railways, Highway and Tourist Routes

The landscapes beside means of transportation into the park are considered the windows to the park and they should be protected and repaired if any damages may occur. The main measures include:

- prohibit construction of any new means of transportation in the Core Zone, and control the new roads and railways across the Buffer Zone
- carry out the plans for ecological restoration and landscape restoration beside transportation routes mainly by natural selection in the park under the principle of taking advantage of good scenery, and getting rid of unpleasant scenery
• cultivate dispersing networks of local species along the sides of transportation routes, the land tenures of which are state-owned and collective, by landscape localization; and avoid the urbanization of landscapes

• use ecological materials for construction and ecological friendly vehicles for the park’s transportation, such as battery-run vehicles

• mark significant attractions along the routes, such as landscapes, species and relics

4.4.5 Construction of the Entrances of Shilin Park and Protection of natural Surroundings

The main entrances to the park are the final stop of the Kunming-to-Shilin highway, which the Ashima Cultural Ecological Garden is found and goes to the new tourist serving center; the entrance to Naigu Stone Forest, the entrance to the Major Stone Forest sightseeing areas, the entrance to Grand Waterfall, and the entrance to Lake Changhu. All of these are the gateways for the identity and image of the park, and would inspire visitors to the park. The main measures for construction and protection are:

• mark the attractions characteristic of their scientific significance and clearly mark tourist routes

• strengthen to protect the surroundings of the natural attractions by safeguarding the natural scenery, and give prominence to both the natural and the cultural characteristics

• conserve or cultivate distinctive atmosphere in the areas open to tourist

• keep in mind that any construction and building for parking, tourist reception center, should not spoil the natural beauty and environment

4.4.6 Construction of the Infrastructure of the Villages and Tourist Service Base

The construction of the infrastructure should be mainly involved in the residential areas, villages, tourist service areas in the Buffer Zone and Proving Zone/Tourist serving zone with protected farmland. The main measures for managing the construction include:

• protect the local residence and the surrounding characteristic of the local ethnic and natural beauty

• not damage the intrinsic landforms, and not disturb the natural evolution of Mizhi forests

• create afforestation next to all architecture
- improve infrastructures and sanitary conditions, and properly dispose of all waste materials

4.4.7 Management of the sizes and styles of construction and building

(1) Controlling the sizes and styles of architectures in the areas open to tourists
- the height of all buildings in areas open to tourists being kept to one storey and not over two stories
- materials for construction being local and ecological, instead of the modern ones such as ceramic tiles, colored glaze, glasses, etc
- the styles of new architecture being characteristic of ethnic and local flavor, and generally with the required sloped-roof
- architectural colors, preference on white, gray, green, blue and yellow, not to red

(2) Controlling of sizes and styles of architectures in other areas

The areas defined here refer to ones outside of the areas visited by tourists, including the villages in the park and the integral area of tourist service
- the stories of the buildings will normally be only two and absolutely not over three, except for special building
- materials for architecture should be local and ecological, instead of the modern ones such as ceramic tiles, colored glaze, glasses, etc
- architecture styles characteristic of the ethnic and local, generally with the required sloped-roof
- the colors for architectures preference on white, gray, green, blue and yellow, not to red
- keep afforesting coverage over 40% of the constructed areas
- buildings density preferably less than 40% of the constructed areas
- volume density of buildings being less than 0.8

4.4.8 Management of planting and creating forests

It refers to the controls of planting and creating forests in the park, especially in the Core Zone and Buffer Zone.
- set up an idea that the biodiversity and local vegetation is part of the integral identity of Shilin National Park
• publish and publicize the plans and the prospects of expected plant communities in Shilin National Park together with planting skills and list of species for afforestation
• publish and publicize the lists, icons, cultivation methods and techniques of the suggested species, especially endemic species, for local afforestation
• publish and publicize the lists, icons, and eradicating methods and techniques for dealing with harmful and invasive species
• set up a mechanism and an effective organization for checking introduced species and monitoring and controlling invasive species in the park
• allocate duty areas for afforestation to the organizations of interests in the park and county with defined aims of afforestation on the basis of land tenure, managing and running rights, and vegetation coordinated with functions of the park
• specify a leading role of The Management Bureau of Shilin National Park and the related departments of the county government in afforestation
• set up and improve seedling gardens of local species in Shilin National Park
• finance biodiversity protection and restoration and set up a fund for the protection and restoration
5. Management Plans of Sub-Areas of Shilin National Park

On the aims and requirements of the classification and zoning of park management, the management plans of sub-areas/zones should be erected, particularly for the next 10 years, and further to realize the aims of the park’s development.

5.1 Management Plan for Comprehensive Tourist Serving Area

**Location:** in Proving Zone/the tourist serving zone with protected farmland, from the start to the final stop of the Kunming-Shilin highway, from the north to Sanjiacun Village, from the south to the newly built wrestling grounds, from the west to the east part of Lufangtang Reservoir, and from the east to the eastern part of Yangchang Seedling Garden

**Functions:** Shilin tourist service and management of the park

**Projects:** the center of the Shilin Tourist Management, and Building of The Management Bureau of Shilin National Park, Stone Forest Geology Museum; center of tourist information and visitors distribution; center of educating-and-training of Shilin National Park, the center for local ethnic culture, arts, sports and festivals; tourist shopping centers, accommodations and recreation centers, the ethnic arts and crafts processing and selling centers, and the Shilin Convention center.

The management measures include:

- publish and publicize the developmental plan of the Shilin Comprehensive Tourist serving area with the current prospects of the area
- inspect all projects based on the corresponding laws and regulations and the revised Master Plan of Shilin National Park(2004-2030), all projects adopted to public bidding
- ensure that construction materials and colors match the natural beauty and the ethnic characters
- afforested species and landscapes match the management of planting and protect present local vegetation and waters
- fully afforest along side all buildings and demolished sites with demands of landscapes matching the natural surroundings(Stone Forests and Stone teeth)
strictly control constructed materials which are non-compatible with the environment, and properly dispose of liquid waste, garbage, dust, noise and solid waste.

- all of vehicles for tourists should be ecological and compatible with environment, in particular from the comprehensive tourist areas in the Major Stone Forest and Minor Stone Forest Sightseeing Spots.

- improve ethnic-nationality touring guide teams and edit the series of prospectus for Shilin tours and touring maps.

5.2 Management Plan of Major and Minor Stone Forest

Location: from the northern boundary of the present park through Stone Forest Lake, to the visiting areas of the Major and the Minor Stone Forests, from the southern end to Liziyuanqing, from the western end to Wukeshu Village, and Wangnianlingzhi (Mushroom Stone Pillar) and from the eastern end to Bushaoshan.

Functions: the Core Zone, and the Buffer Zone and tourism.

Projects: sightseeing, experiencing ethnic songs and dances, ethnic costumes displays, demonstrating values of interest in Stone Forest, protection of relics and models of Stone Forest’s evolution as well as with hydrologic systems and water, protection and restoration of local vegetation.

The measures for management include:

(1) For the Core Zone and Buffer Zone

- readjust the land-use structure with farmland and land for grazing returned to local vegetation and landscaped.

- delimit the Core Zone and the Buffer Zone clearly marked and explaining.

- demolish the unnecessary buildings, and restore environments characteristic of nature.

- perfect all signs that demonstrate the values of interest in the Zones.

- carry out the strict strategy of environmental and sanitary management and prevent the zones from liquid waste (polluted waters).

- control tourist flux to Liziyuanqing Stone Forest and Wangnianlingzhi Stone Forest in terms of the regulations of scientific tourism.

- afforestation along the lakes and touring paths by natural methods and introduce...
local species with the aims of localized attractions, especially those which are key member of the local climax plant communities and easy dispersal, and eliminate harmful species and invasive species step by step

- return patches of farmlands in the Core Zone to local vegetation, ecological planting in paddy fields in Bimutan Pond, and make the ecological orchards into attractions, and build up the forest networks along the periphery of the zones

(2) Readjusting and improving of touring patterns

- construct an integral touring space and perfect auxiliary facilities, by increasing touring areas from 1 km² to 3.18 km²
- afforestation along all roads with aims of localized attractions by combining natural methods by planting suitable local and exotic seedlings, and control nomadic grazing and prevent the zones from fire disasters
- remove the entrance to the sightseeing destinations from the present to Shuangtang and construct the new comprehensive tourist service area on the basis of the plan of the Shilin Comprehensive Tourist Serving Area
- close down the routeways to the sightseeing area from Shilin town to Lufangtang Reservoir and from Lunan-Shilin Road, change the line of Luan-to-Shilin from the southwest side of the new staff residential quarter to the northwest site directly towards Shilin Town and towards new entrance, the present touring paths used as auxiliary path and evacuation route.
- construct the battery-driven car touring route from the Shuangtang Entrance, Tiankongling to Minor Stone Forest and finally to the rounded-Stone Forest-way with an increasing walk-and-sightseeing trail from 15km to 25km
- perfect tour guiding systems and edit touring and sightseeing brochures or handbooks

(3) Controlling and improving of touring routs and sightseeing spots

- reconstruct the landscapes around the Sifangtang Pond by landscape restoration characteristic of naturalness and perfect afforestation along side of the pond
- reconstruct Stone Forest Lake by demolishing and removing scattered construction and facilities around the lake while rebuilding a pre-area with a favored atmosphere
characteristic of Shilin naturalness, such as recreational attractions and green lands, before entering into the major sightseeing area, no permits for new facility construction except for basic tourist service

- permits only for dismantling in Wukeshu Village and not for new construction, i.e. demolish buildings and architectures which would spoil the values and integral attraction of the zone, retain those characteristic of local ethnic settlement and architectural style and change them for ethnic tourism and tourist service, reduce the population

- demolish the permanent building at the Wonder of Stone Forest and the Shilin Post Office building, and return the place to landscapes characteristic of nature

(4) Controlling the size of tourist guests and activities

- the maximum number of tourists per day being below 13,000 at Major and Small Stone Forest

- improve capacity analyzing and monitoring at tourist areas, and control tourist capacity at some key spots
5.3 Management Plan for Naigu Stone Forest

Location: the northern part of Shilin National Park: from Sibeihou Village as the southern boundary, from Zhantun Village to the south side of Songyuan Mountain as the northern side.

Functions: the Core Zone, the Buffer Zone and Sightseeing, Eco-touring

Projects: display values of interest in Stone Forest and protect relics and models of Stone Forest evolution, particularly dolomitic limestone stone forest; protect and conserve local vegetation as well as hydrolic systems and waters, and popularize geological tours, sightseeing tours (cave showing) and ecological tours.

The main measures include the following

(1) Touring
- expand touring space from 0.59 km² to 0.93 km²
- perfect facilities for touring service at the entrance including parking, food service, touring guides and shopping
- perfect recreation and holiday attractions at the western area of the entrance: including tourist reception, food service, facilities for recreation and health
- pay attention to protecting the harmonious environment of attractions with natural landscapes, and construction which obeyed the principle of low-level and small size pattern, and strictly carry out the environmental protection plan
- extend the present touring route to Damaidi Stone Forest by forming touring circling route by increasing touring pathway from 6.5 km to 11.5 km
- give up the peak-climbing route and operate battery-run cars for key circling routes
- clear up exotic plant populations and control the expansion of invasive plants
- train tour guide and edit tourist brochures or handbooks

(2) Village rebuilding
- reconstruct the Sibeihou Village for an ethnic tourist village and develop rural tours
- improve sanitary facilities and readjust domestic energy structure and reduce the use of firewood
- Readjust land-used structure for restoring nature on the basis of the revised Master Plan of Shilin National Park
Management Plan of Shilin Karst, Yunnan

- build an ethnic pagoda on the top of the Sishan Mountain as a symbol of Naigu Stone Forest

(3) Attractions and architectures
- strictly control the numbers and styles of projects/construction, and manage afforestation with clear standards for producing harmonious and integral landscapes
- return patches of farm lands in the Core Zone to local vegetation and develop pastoral landscapes
- cultivate sound environment for recreations and sightseeing in the periphery of the Buffer Zone by producing aesthetic forests, economic and fruit forests
- control nomadic grazing and prohibit hunting

(4) Environmental management
- protect Pudoucun Stone Forest and Mocun Stone Forest in the Buffer Zone as part of their integral environment
- Allocate 30m along side the Ba river from the Naigu Stone Forest for revegetation with no permit for man-made development, such as construction, buildings and farming
- prevent the catchments area of the Ba river from any non-disposed wastes and chemicals
- control chemicals in farmlands around the Tuanjie Reservoir
- control stony hills beside the Tuanjie reservoir and strive to bring back local vegetation
- improve sanitary conditions of Zhantun Village and readjust domestic energy structure and develop rural and ecological tourism

5.4 Management Plan for Wangchengshan - Qingshui Pond

Location: the central part of Shilin National Park

Functions: the Core Zone and the Buffer Zone

Projects: conserve and improve the natural environment of the stone forests, protect their relics and typical developed sites as well as local vegetation, protect catchment and headwater areas; display values of interest in Stone Forest, Shilin pastoral scenery and eco-touring characteristic of local ethnicities
The main measures of the management:

(1) Values of interest in Stone forest

- create clear signs for the border between Core Zone and Buffer Zone
- protect the Core Zone in a closed state
- register sites of various stone forest with types, character, relics and naturalness
- protect the environment beside the karst lakes and springs, and control soil erosion, and restore the integrity of the waters
- regulate land use according to corresponding laws and ordinances by stopping of farming extension in the zone; cultivate pastoral scenery in farmlands which could not return back to local vegetation, and control chemicals
- control the range and capacity of raising livestock in the zones, particularly in regard to nomadic livestock
- control those exotic/invasive species for afforestation which would have a negative impact on restoration of local vegetation, and economic forests cultivated in stretches in the Buffer Zone and Proving Zone/Tourist serving zone with protected farmland
- prevent the zones from fire disaster and no permits should be issued for hunting

(2) Ethnic village

- three ethnic villages in the Buffer Zone: Qingshuitang, Weiboyi and Suogeyi
- make plans for the three villages’ development and maintain their traditional appearance with their infrastructure enhanced
- label the Mizhi forests with their values and afforest villages with local species for ethnic attractions
- control encroachment of new settlements to the Core Zone
- improve environmental sanitary conditions and readjust the domestic energy structure, and develop a forest designed for a rural energy base
- guide farming and control grazing areas and the number of livestock, and develop pastoral scenery, an economic forest and fruit forest
- control quarrying and restore damaged sites to new landscapes and new vegetation
- restore local vegetation beside rural roads for the rebuilding of dispersed sources of local species along the roads
(3) Touring management

- control scientific touring in the Core Zone and develop pastoral eco-touring products
- label sites of values of interest in Stone Forest
- mark sites of catchments and headwater areas
- mark significant species and plant communities and their areas
- Control kinds of vehicles and encourage hiking touring and investigation in the prohibited zones and do not leave any wastes
- no permits for construction and buildings except for basic facilities for security, tour monitoring and local residential housing

5.5 Management Plan for Suoyishan–Wenbi Mt.

**Location:** the southern part of Shilin National Park.

**Functions:** the Core Zone and the Buffer Zone

**Projects:** Protect values of interest in Stone Forest with natural environment, protect local species bank and patches of zonal vegetation, catchment and headwater areas, display values of interest in Stone Forest, and develop rural attractions and rural folk eco-touring

the main measures include:

(1) Values protection

- delimit the border between Core Zone and Buffer Zone with clearly marked signs
- protect the Core Zone in a closed state
- register Stone Forest by types, relics, characters, locations, natural states
- manage land with laws and regulations and control farming sizes by stopping expansion into the Core Zone, develop pastoral scenery in farmlands by controlling chemicals
- protect the Mizhi forests by conserving them in a natural state for evolution by prohibiting felling
- control grazing under principle of environmental capacity
- control the planting of species for afforestation in the zones, especially invasive and exotic ones which harm local vegetation, and develop the economy and forests designed as a source of fuel in stretch in or outside of the Buffer Zone and Proving
Zone/Tourist serving zone with protected farmland

- prevent the zones from fire disasters and control hunting

(2) Ethnic village management

- ethnic villages Suoyishan and Dawanqing being in the Buffer Zone
- make plans for the development of the two villages while combining and conserving ethnic traditional appearance by improving the infrastructure
- mark values of interest in the Mizhi forests and conserve their natural evolution, strengthen afforestation in rural areas with local species for rural attractions
- control new local settlements near to the Core Zone
- cultivate local vegetation attractions along rural roads for both the scenery and dispersing the source of local species
- improve environmental sanitary conditions, and readjust the family energy structure by developing a firewood base and other available means
- help local farmers to develop the economy by increasing incomes, and readjusting the planting structure and controlling grazing and the cultivation of pastoral attractions and economic forests
- control quarrying sites and size, and restore damaged sites with ecological and landscaping means

(3) Tourism management

- control tourism in the Core Zone and develop pastoral eco-tourist areas or lines
- mark values of interest in Stone Forest and their relics
- mark and protect headwater and catchments areas
- mark significant local species and plant communities
- edit tourist and traveling booklets and maps

5.6 Management Plan of Changhu Lake

Location: the southern part of Shilin National Park and along Weize ethnic village

Functions: the Buffer Zone and the Proving Zone/Tourist serving zone with protected farmland, eco-tourism and ethnic rural tourism with health activities

Projects: protect the Fengcong and karst lakes, local vegetation, ethnic cultural attractions, historical relics, headwater and catchment areas, and develop health sports
tourism with recreation and ethnic culture eco-tourism

The main measures include:

(1) Protection of environment and landscapes

- preserve the natural beauty around Lake Changhu and the surrounding Fengcong scenery
- mark values of interest in the Lake Changlu and their sites
- mark local species and plant communities
- mark the border of the protected areas of Lake Changhu
- prevent the lake and natural scenery from all construction and building
- control grazing, avoid fires and hunting
- manage planting species and promote restoration of local plant communities and develop headwater vegetation
- protect aquatic communities, especially *Ottelia acuminate* community which is typical in the Yunnan–Guizhou karst Plateau lakes
- control chemicals and exotic species, especially invasive ones from harming Changhu Lake

(2) Management of the ethnic village

- Village Weize nearby the lake is typical of the local Yi village
- identify the ethnic village and develop its uniqueness while maintaining the harmony of the village with nature
- improve environmental sanitary conditions and control solid and liquid wastes by enhancing the quality of receiving tourism for rural and eco tourism
- mark famous and ancient trees and the local plant communities
- readjust the farming structure near the lakesides and cultivate rural attractions
- construct local plant attractions along rural roads for both the scenery and the dispersing source of local species

(3) Tourism management

- construct a multi-functional ecological and a recreational tourist base characteristic of the local ethnic identity
- improve the tourist area of 1.47 km² of Lake Changlu with a walking-path beside the
southeast lakeshore, and landscape the jetty and complete other tourist facilities for Lake Changhu’s tourism

- construct performance field for the Torch Festival celebrations, bullfights and other art performances at suitable sites
- construct recreational and sporting ground along the north shore of Changhu Lake, including a golf course, and indoor and outdoor sports arena
- improve the surrounding of Changlu Lake’s dam and build local food services facilities
- construct paths to Shuangjian Mountains, forming a tourist trail from Changhu Lake, through Shuangjian mountains and Dushi Mountain to the Village
- control the tourist environment of Dushi Mountain
- use local species for Mopan Mountian revegetation and construct paths to the mountain
- control fishing activities in the lake
- strictly manage the quality of water in the lake and prohibit sewage from coming in contact with the lake
- perfect guided tours and edit touring booklets and maps

5.7 Management plan of the Grand Waterfall

Location: the southwestern part of Shilin National Park and 25km away from the Major Stone Forest

Functions: the Buffer Zone and the Proving Zone/Tourist serving zone with protected farmland, and scenic spot

Projects: protect the Grand Waterfall as nice scenery with local species and plant communities; develop scenic tourism and eco-tourism.

The main measures include:

(1) Ecological reserve and protection of the waterfall attraction

- mark values of interest near the karst waterfall
- preserve the integrity of the waterfall attractions, protect the natural vegetation in the upper watercourse, protect the grandness of the waterfall, and maintain the naturalness of the waterfall pool with a pleasurable attractive complex
● restore local vegetation beside the Grand Waterfall, and control soil erosion
● protect local vegetation on two sides of the upper river of the Grand Waterfall, to landscape the rural paths on the west side of the Ba river as up to the Grand Waterfall together with the convenience of transportation improved
● demolish old construction and houses nearby the Grand Waterfall and restore local vegetation
● control the western outlet of the Grand Waterfall by extending eastward waterfall and restoring the Waterfall to a more grand state
● mark the rare and endangered species such as Toona iliata var. pubescens, Nouelia insignis, Zelkova schneideriana Han.-Maz
● control grazing and avoid fires and hunting

(2) Manage tourist paths and service facilities

● construct the new entrance servicing area at the crossing of the Ba river with the Dakekehe river with suitable tourist service facilities, set up a sign for the entrance of the Grand Waterfall at the mouth of the Sanchahe river
● demolish all food facilities at the top of the waterfall and landscape the damaged site for water and local vegetation
● reconstruct a new circling trail from the north side of the Sanchahe River through the upper course of the Qingshui river, finally to the pool of the Grand Waterfall or the foot of Great Stony Mountain which allows tourist for experience the wholeness of the scenery of the Grand Waterfall and reconstruct the existing entrance for the final stop of the Grand Waterfall tour with facilities for a new stop which will allow for taking a break and time for shopping
● argue for the construction of a cableway 500m away from the Western Slope of the waterfall pool for improving accessibility and enjoying the conditions, and the cablecar connecting to the tourist trail along Qingshui river for a better circling tourist path
● construct convenient facilities for rest and viewing at the Waterfall Pool
● control the environment and construction in the Minor Waterfall and landscape the surrounding of the Dadieshui Power Station
- perfect tourist guidance systems and edit tourist brochures
Management Plan
Of Libo Karst, Guizhou

Buyi and Miao Nationalities Autonomous Prefecture
Of South Guizhou, October, 2005
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1. Present situation of the Libo Karst Nominated Sites

1.1 Regional location

The Libo Karst Nominated Sites for World Natural Heritage in Guizhou Province (short name: the Libo Karst Nominated Sites) are located in Libo County of South Guizhou Buyi and Miao Autonomous Prefecture, Guizhou Province, China. Libo County (Yuping town) is 320 km from Guiyang City (province capital) and 145km from Dunyun City (prefecture capital).

1.2 Extension and area

The Libo Karst Nominated Sites includes Maolan National Nature Reserve in Guizhou, Daqikong and Xiaqikong sections of Zhangjiang Scenic and Historic Interest in Libo. The Libo Karst Nominated Sites cover 29518ha (central coordination of E107°58'30" and N25°13'15").

1.3 Resource values

1.3.1 Scientific values

Within the Libo karst nominated site, eco-environment developed a special one with thin soil, scant water and rich calcium due to the influence of special lithology, underlying rocks and karst process; and plants living there gradually adapt to this special environment and are characterized by drought hardy, lithophilous and calciphilous. Therefore, the ecosystem turned into a typical and special one — karst ecosystem.

The Libo karst nominated sites are characterized by trolling terrain, various landform types, favorable water and heat condition, abundant species and complex vegetations; so small habitat with diversities are gradually developed and provide feasible habitat for biology with different ecological features. Especially the karst forest covering most areas directly protect complex and various plant combination possessed by karst forest, and the special eco-environment combined by karst forest turn into natural habitats with the most significance and importance for biological diversity conservation.

The Libo karst is submitted for the World Natural Heritage because it satisfies the World Natural Heritage criteria ( ), ( ).
1.3.2 Esthetic values

Within Maolan section, cone karst landforms and immense forest vegetation combine to display special, rare and graceful landscapes of landforms, hydrology and forest. So it is proved to be unrivalled comparing with other karst landscapes. The Daqikong and Xiaoqikong sections are composed of mountain, stone, water, forest, cave, lake and waterfall etc, together with steep cone summit and circumfluent streams, which is rather attractive because of the harmony of natural landscape with vital force and human landscapes with old history.

1.3.3 Cultural values

Libo is characterized by long history and colorful national culture. Within the Libo karst nominated sites, the aboriginal minorities include Yao People, Buyi People and Shui People, Zhuang People and Miao People etc. Their language, song and dance, festival and custom with each feature contain rich connotation and historical origin, whose values are embodied on their special views combining rustic culture of traditional custom and wonderful natural landscape environment.

1.3.4 Tourism values

A serial of activities, such as research education, forest trip, cave exploration, drifting, climbing activities and sharing ethnic customs, may be taken in the Libo karst nominated sites. Especially ecological tourism, the combination of sharing tourism and popular science education may promote public knowledge about environmental consciousness and passion for nature.

1.4 Present situation of conservation

The two sections included in the Libo karst nominated sites possess different features of national nature reserves and national scenic and historic interest, and are protected by relevant law and regulations, too. Maolan Nature Reserve is well protected through dividing into three parts: core area, buffer zone, and experimental zone (experimental zone, ecological tourism zone). The Daqikong and Xiaoqikong sections of the Zhangjiang Scenic and Historic Interest in Libo are protected according to Extra Grade, , , level. In addition, some sections are also protected by folk tradition.

At present, effective systems of multilevel management have been established in the
Libo karst nominated sites, so to possess some given guarantee on the aspects of personnel, organization and fund etc. The parts with outstanding universal values in each section remain completely perfect, and the integrity of ecosystem and natural environment also is kept in a good condition; but a lot of insufficiency still is found on administrative capacity.

1.5 Threat and pressure

1.5.1 Developmental pressure

Within the Libo karst nominated sites, population density in Maolan Nature Reserve is 19/ km²; both the population quantities and lower land output determine that population need more cropland, even gradually more; so the natural reserves will take measures of Construction Planning of Population Control and Community Development. Although the natural forest and wildlife are under the protection of national law, cutting wood and hunting often take place in and around the Libo karst nominated sites. Therefore patrol for forest must be strengthened; to increase intercommunion with each community and promote inhabitants’ participation protection.

1.5.2 Environmental pressure

Due to serial affects from various human activities, the natural landscape, biodiversity and eco-environment all are under given pressures; but most parts of the Libo karst nominated sites remain in good conditions, therefore we should lessen the bad affects from human activities in some extent.

1.5.3 Natural disasters

Within the Libo karst nominated sites, small scale forest fire occasionally take place because the local farms in mountain areas reclaim cropland through firing forest and burn up woods to collect manure. Therefore we should take effective measures to guard against forest fire and actively take forest diseases and insect pests prevention. The climate harms include flood, hail and drought, otherwise landslide, debris flow and soil erosion is likely to take place. In addition, the three systems constructions of monitoring prewarning, quarantine and prevention must be speeded.

1.5.4 Visitor/Tourism pressure

Because the regional economy of Libo County is undeveloped, tourism income will be favorable to protect resources and improve living standard of local inhabitants living in
and around the Libo karst nominated sites. But in the event of no control, rapidly developed tourism will result in ecological deterioration, spread of water loss and soil erosion and destruction of wildlife habitat to adversely affect karst landform and environment.
2. Target, basis and principle of conservation

2.1 Conservation target

1. Protecting the authenticity of resource: To protect the primary condition, the primary ability of ecosystem, authenticity of cultural resource and scientific, historic and cultural values in the process of conservation, succession and inheritance.

2. Protecting the integrity of resource: To protect the integrity of resource, environment and karst ecosystem. To definitude the boundary of the Libo nominated site and buffer zone and work out correct protection measures in order to effectively protect and manage.

3. Protecting the diversity of resource: To protect the basic ecological process and life support system of cone karst biosphere; to conserve hereditary diversity of biology, especially rare and endangered species and habitats; to ensure perpetual utilizations of ecosystem and specie resources.

2.2 Conservation principle

Integrated conservation principle, coordinated conservation principle, operability principle, sustainable principle

2.3 Conservation basis

1. Environmental Protection Law of the People’s Republic of China

2. Land Management Law of the People’s Republic of China

3. Water Law of the People’s Republic of China


5. Law of the People’s Republic of China on the Protection of Wildlife


7. Regulations of the People’s Republic of China On Nature Reserves

8. Provisional Regulations of the People’s Republic of China Concerning the
Management of Scenic and Historic Interest and Implementary Measures of Provisional Regulations Concerning the Management of Scenic and Historic Interest

9. Measures of Guizhou Province Concerning the Management of Scenic and Historic Interest

10. Guizhou Province national folk culture protection rule

11. Regulations of Libo County, South Guizhou Buyi and Miao Autonomous Prefecture, Concerning the Management of Zhangjiang Scenic and Historic Interests


2.4 Planning term

The plan term is effective from 2005 to 2015, eleven years in total.

3. Conservation division and requirement

3.1 The Libo Karst Nominated Sites

The Libo Karst Nominated Sites cover 29518ha including Jiaou Xiang, Chaoyang Town, Yaoshanyao Xiang, Dongtang Xiang, Wengyang Xiang and Yongkangshui Xiang of Libo County.

Within the Libo karst nominated sites, limited human activities should be permitted; but agriculture should not be extend, agricultural land of >25°, should be recovered ecological environment with manpower resource. To strictly control the construction of infrastructure, if necessary, passed by strictly scientific environmental estimation and monitoring. The inhabitants should decrease the dependence on natural resources through looking for substitutable sources; so it is a good idea to develop tourism, but must limit in tourist capacity and monitor the affects for environment resulted from tourism; in addition, existing industries must be gradually closed, even moved.

3.2 Buffer zone

Buffer zone covers 43498ha including Jiaou Xiang, Chaoyang Town, Yaoshanyao
Xiang, Dongtang Xiang, Maolan Town, Suiyaoshui Xiang, Wengyang Xiang, Yongkangshui Xiang and lao Cun of Libo County. Within the buffer zone, harmonious protections are implemented; for example, all construction projects in buffer zone should have better harmonious transition with the Libo karst nominated sites, and forbid to arrange contaminative industry to destroy landscape environment and ecosystem.

4. Conservation contents and measures

4.1 Cone karst conservation

4.1.1 Karst landforms

1、To forbid to quarry, dig sand and collect earth to prevent destroying vulnerable karst landforms. The digging due to searches activities must be passed through cautious scientific argumentation. The behavior destroying karst landforms should be imposed punishment in accordance with the law, even criminal responsibility for cases of gross violation.

2、To control the affects of human activities to karst landforms, gradually decrease or control the inhabitant quantities in the Libo karst nominated sites. The landforms destroyed by human activities should be taken measures to try best to recover original conditions of rock lanforms.

3、To strength the protection of karst margin environment to create characteristic environment belonging to own karst. What more is to prevent karst rock desertification, such as the phenomena of soil attenuation, bedrock nudity and productivity of land degeneration even loss; so we should formulate special planning of rock desertification integrated regulation.

4、Directed toward karst landforms, to formulate corresponding special protection planning and establish the monitoring system of karst landforms to timely treat with monitoring indicators and results.

4.1.2 Karst cave

1、Measures must be taken to protect ambient environment quality, and keep the variety of eco-environment in cave. Human activities, especially activities leading
underground cave distortion and destruction of digging, pumping, impounding, explosion and jolt should be controlled and forbidden. Natural ventilating conditions in caves should be strictly forbidden to prevent off-color, drying, abscission and damage of travertine sediment.

2、Opened karst caves should be take reinforce measure for dangerous cave passages to ensure tourist safety. Make sure reasonable tourist capacity and forbid building any service establishment in exception for necessary tourism and safety infrastructure; forbid picking stalagmite or destroying original objects in caves; don’t permit discard any rubbish in cave for sanitation service in order to prevent pollution. The caves which are kept in good condition and is waiting for development should be shielded and set up signs on the cave entrance to prevent excavating.

3、Within the Libo karst nominated sites, at present opened karst caves include Di’e Cave, Tianzhong Cave, Jiudong Tian and Jinshi Cave etc, so they should be completely protected and monitored in means of ventilating equipment and treating measures. In addition, to intensified explanatory education of karst caves, strength protection consciousness and actively participate protection.

4.2 Biology specie conservation

4.2.1 Flora

1、Strictly forbid any destroying behaviors of reclaiming, burning, cutting and gazing etc, gradually return land for harming to forestry and conserve forest and strength vegetation greening and water and soil conservations to recover destroyed forest system.

2、The complete resource data base of rare and endangered plant is established in order to develop sustainable and long-term investigation and monitoring. Special protective belts are planned for rare and endangered plant, in which anybody isn’t permitted to enter in exception of administrative demand and permitted scientific researches. Collecting plant samples in the Libo karst nominated sites is forbidden or permitted by relevant administrative departments if necessary.

3、Prevention and treatment of forest insect pest, especially biological prevention and
treatment techniques, should be strengthened. Exotic tree species are forbidden carrying and introducing into nominated sites in principle; if introduction is necessary, these exotic species must be passed environmental effect evaluation.

4. To strengthen fire protection and enrich fire prevention headquarters; in the Maolan and Xiaoqikong karst forest, means of escape, such as fire guard, monitoring warning, fireproofing passages and shelter belts, should be established to forbid fire into forest areas to prevent forest fire.

5. To establish experimental base of the Libo karst forest hydrographic effect and explore space-time relation between forest ecology and hydrographic effects; they may provide quantitative basis for scientific researches.

4.2.2 Fauna

1. Within the Libo nominated sites, various catching and hunting activities are strictly forbidden to prevent destroying wildlife inhabitant environment. Measures of animal quarantine are taken to forbid carrying wildlife with no quarantine into the nominated sites.

2. Rare and endangered animals are rescued and protected. The complete resource database of rare and endangered animals is established in order to develop sustainable and long-term investigation and monitoring. The special protective belts are planned for rare and endangered animals, in which nobody is permitted to enter in exception of administrative demand and permitted scientific researches. Collecting animal samples in the Libo karst nominated sites is forbidden or permitted by relevant administrative departments if necessary.

4.3 Environmental quality conservation

4.3.1 Water environment

Within the Libo Karst Nominated Sites, all rivers belong to hilly rainfall rivers, so they possess strong purification capacity. Water quality of surface water should reach the level of Environmental quality standards for surface water (GB3838-2002). According to Integrated wastewater discharge standard (GB8978-1996), the wastewater of
nominated sites should reach the discharge standard. The surface water and life wastewater discharge should be monitored. To regulate all pollution sources and forbid to establish new discharge exits on their banks. To strictly control the tourist accommodation quantity. In the process of exploitation, lakes and pools meet the contradiction of tourism development, breed on the water surface and water quality; we must strictly comply with the first protection principle to regulate environment.

4.3.2 Soil and vegetation

To workout and complete the soil resource listing and formulate corresponding special protection planning. To strength the protection of karst landforms and primary vegetation, do forest conservation and forest planting and strictly forbid human destroy behavior of hackling and cutting at random in order to preserve water, fix soil and prevent natural disasters. The forest percentage of coverage in the Libo karst nominated sites should reach above 70%.

4.3.3 Ambient environment

Ambient environmental quality in the Libo karst nominated sites should implement the level standard of Ambient air quality standard (GB3095-1996). To control coal smoke pollution, renovate the structure of life energy and popularize firedamp pools. To establish the monitoring system of ambient quality, strictly control new pollutant sources and mechanically-operated vehicles into these areas, lessen affects of tailgas discharge and popularize environmental protection energy-saving traffic vehicle.

4.3.4 Noise environment

Noise level in the Libo nominated sites should under level standard value of environmental noise Standard of Environmental Noise of Urban Area (GB3096-93). To overall popularize environmental protection energy-saving traffic vehicle and set up monitoring spot in main entryway to forbid vehicle horning.

4.4 Protection of local culture

4.4.1 Community life

The inhabitants in the Libo karst nominated sites and buffer zones respectively are 5751 persons and 24747 persons. The life of inhabitants is closely linked with its
environment; so referring to community developmental planning, we must improve their participant management, take effective measures to control their activities and workout the planning of villages and population. According to population fluctuation trend, community residential spots in the Libo karst nominated sites and buffer zones may be divided into four types for effective regulation and control: the type of movement, shrink, control and habitat.

4.4.2 National culture

To protect the integrity and/or authenticity of national culture, protect the significantly historic, cultural, scientific and emotional information carried in endemic villages and protect natural environment and cultural atmosphere of endemic villages. Must remain traditional architectural style and integral features on different aspects of architectural layout, shape, hue and material, completely remedy ones with serious destroy to recover “prototype”. To regulate village environment, complete the infrastructure of water, electricity and communities, sufficiently consider the requirements of fire protection and collect inhabitants’ living rubbish and wastewater to improve their living condition.

5. Reasonable utilization and development

5.1 Scientific research and investigation

The long-term localizations for ecosystem and other specie nature resource pool provide scientific basis to know nature and reasonably utilize natural resource and monitor environment quality. In addition, do the ecological investigation and research of main protective species and the affections of specie resources provoked by ecosystem change.

Before entering the nominated sites to engage in research practice and scientific experiments, must be approved by the relevant administrative department and work in the appointed areas. To set up the base of research practice and scientific experiments through collecting rare plant and establish rare plant garden. And to purchase apparatus and equipment refered to research practice.

5.2 Popular scientific education

For karst phenomena and specific phenomena of karst forest, to introduce their
formation reason, features, status and significance in the process of earth history and ecosystem and further evolution with popular scientific language. To actively organize tourist to develop ecological tourism, establish marker system and develop popular scientific activities of ecology, botany, zoology and physical geography. Tour guider should be educated to introduce some scientific knowledge of each spot and other environmental common sense to tourist.

5.3 Tourist capacity

For the Sanchahe tourism areas of Maolan Nature Reserve, the daily tourist capacity permitted of ecological tourism is 1349 persons; if there are 250 open days in a year, so the yearly tourist capacity reaches to 337,250 persons, and the most reasonable tourist capacity shouldn’t exceed 300,000 persons. The Daqikong and Xiaoqikong spots adapt tourism course method and bayonet method, the tourist capacity of 3000 persons; if there are 300 open days in a year, so the yearly tourist capacity reaches to 900,000 persons.

The tourist capacity of the Libo karst nominated sites is measured adapting the totaling of each division capacity, up to 1.2 million persons of the yearly tourist capacity. To strictly forbid exceeding the capacity and gradually take some measures of sequential rest for some spots.

5.4 Tourism organization

Within the Libo karst nominated sites, a series of activities, such as forest trip, cave exploration, drifting, boating, climbing and tasting endemic customs, may be developed. Tourism service facility system must be uniformly planned according to best tourism course to reach the combination of comparative convergence and proper scatter. And the quantities of rest booths and tourism service facility should be strictly controlled and gradually established.

5.5 Explanatory education

It is an active and dynamic expressive mode of professional tour guider to explicate and answer the questions for tourists in the process of guiding tourist to tour. The relevant thematic explanation should be assisted with the shows of samples, model, pictures and literal; and to set up literal explanatory and pictorial brands and indicators; make tourist familiar with all items known and complied with manual.
5.6 Program evaluation

Within the Libo karst nominated sites, the site selection and distribution should meet the requirement of Nature Reserve Integrated Plan or Scenic and Historic Interest Integrated Plan for all construction projects. And construction projects must be certificated with Construction Using Land Plan Permit, Construction Projects Plan Permit, Construction Item Selected Location Prospectus and Environmental Effect Appraisal Report.
6. Monitoring system and check

6.1 Monitoring means

GIS monitoring method, a usual monitoring method at present, abstract changed information through two phase comparison of satellite image to check changed areas according to the monitoring basis of relevant planning. In addition, sample survey and public opinion polls for local inhabitant and exotic tourist to improve protection and management.

6.2 Monitoring types

Including the monitoring on forest and environment, tourism, community, as well as national culture and human relics.

6.3 Monitoring indicator

Monitoring indicators are the most important representative of weighting protection condition, and closely contact with their outstanding values. According to itself characters and protection contents of the Libo karst nominated sites, the indexes may be summarized as the following main monitoring indicators:

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicators</th>
<th>Periodicity</th>
<th>Location of Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cone karst integrity (distribution, boundary, type)</td>
<td>Year</td>
<td>Administration of the Zhangjiang Scenic and Historic Interest of Libo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration of the Maolan Nature</td>
</tr>
<tr>
<td>2</td>
<td>Number and prefect intension of the Libo cone karst spots</td>
<td>Year</td>
<td>Administration of the Zhangjiang Scenic and Historic Interest of Libo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration of the Maolan Nature Reserve of Guizhou</td>
</tr>
<tr>
<td>3</td>
<td>Species and numbers of animal</td>
<td>Year</td>
<td>Administration of the Zhangjiang Scenic and Historic Interest of Libo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration of the Maolan Nature Reserve of Guizhou</td>
</tr>
<tr>
<td>4</td>
<td>Species and numbers of</td>
<td>Year</td>
<td>Administration of the Zhangjiang Scenic and Historic Interest of Libo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration of the Maolan Nature Reserve of Guizhou</td>
</tr>
<tr>
<td>5</td>
<td>Exotic species and harm</td>
<td>Year</td>
<td>Administration of the Zhangjiang Scenic and Historic Interest of Libo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Administration of the Maolan Nature Reserve of Guizhou</td>
</tr>
<tr>
<td></td>
<td><strong>Atmosphere quality</strong></td>
<td>Year</td>
<td><strong>Meteorology Bureau of Libo County</strong></td>
</tr>
<tr>
<td>---</td>
<td>------------------------</td>
<td>------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td><strong>Water quality</strong></td>
<td>Year</td>
<td><strong>Environmental Protection Bureau of Libo County</strong></td>
</tr>
</tbody>
</table>
| 8 | **Number of town and population in the Libo nominated sites** | Year | **Administration of the Zhangjiang Scenic and Historic Interest of Libo**
|   |                        |      | **Administration of the Maolan Nature Reserve of Guizhou** |
| 9 | **Number of town and population in buffer zone** | Year | **Administration of the Zhangjiang Scenic and Historic Interest of Libo**
|   |                        |      | **Administration of the Maolan Nature Reserve of Guizhou**
|   |                        |      | **State Soil Resources Bureau of Libo** |
| 10| **Area of cropland in the Libo nominated sites** | Year | **Administration of the Zhangjiang Scenic and Historic Interest of Libo**
|   |                        |      | **Administration of the Maolan Nature Reserve of Guizhou**
|   |                        |      | **State Soil Resources Bureau of Libo** |
| 11| **Area of cropland in buffer zone** | Year | **Administration of the Zhangjiang Scenic and Historic Interest of Libo**
|   |                        |      | **Administration of the Maolan Nature Reserve of Guizhou** |

### 6.4 Check and treatment

After the Libo karst nominated sites construct perfect monitoring system and decide monitoring indicators, every year the monitoring results are fed back to Administrative Organization of World Natural Heritage in Guizhou, which will be timely checked and rectified by Administration of the Maolan Nature Reserve of Guizhou and Administration of the Zhangjiang Scenic and Historic Interest of Libo.
7. Management regulation and safeguard measure

7.1 Management target

To enable outstanding value of the Libo karst nominated sites to obtain the effective protection in order to maintain its integrity and authenticity; in addition, the local culture are well protected and inherited; participation of protection is well enhanced for the public; the resources are reasonably utilized to carry out the sustainable development.

7.2 Management system

After success of submitting, Guizhou People's Government will establish administrative organizations to instruct, coordinate and supervise the protection and management of world natural heritage sites.

Libo County People's Government answers for the protection and management of the Libo karst nominated sites. And according to respectively different responsibility, all bureaus, such as construction, forestry, culture, environmental protection, state soil, water conservation, tourism, do their best to coordinate, manage and supervise the nomination sites.

7.3 Management agency

Administration of nature reserve and administration of scenic and historic interest are respectively established in Guizhou Maolan National Nature Reserve and in the Zhangjiang National Scenic and Historic Interest of Libo, which concretely implement the protection and management according to respectively different responsibility and power. Other bureaus, such as construction, forestry, culture, environmental protection, state soil, water conservation, tourism and town government, complete other relevant works.

7.4 Management responsibility

1. To propagandize and carry out the national and regional laws, regularity and policy of world natural heritage sites; to organically implement *Guizhou Maolan National Nature Reserve Integrated Plan, Libo Zhangjiang Scenic and Historic Interest Integrated Plan* and relevant safeguard measures.

2. To responsibly organize investigation, estimation and registration of various resources in the Libo karst nominated sites; to formulate its detailed planning or
special planning; to establish dynamic monitoring information system in order to strengthen the supervision and integrated management, and to periodically send planning implementation, conditions of resources conservation and utilization to the department in charge.

3. To answer for managing infrastructure and other public installations in the Libo karst nominated sites, improve the condition of tourism service, strengthen the safeguard, and develop sightseeing tourism and scientific and educational activity.

4. To enhance protection consciousness of the public in the Libo karst nominated sites, strengthen management of community, and actively lead the local farms to develop ecological agriculture to gradually alleviate poverty and become prosperous.

5. To carry out special administrative punishment according to the commission of relevant administrative department.

7.5 Law and regularity

According to the national and regional relevant laws and administrative regularity related to Part 2.3, the Libo karst nominated sites are effectively protected and managed. After success of submitting, Conservation Regularity of the Libo Cone Karst for the World Nature Heritage sites in Guizhou should be worked out according to the present condition.

7.6 Training

To comprehensively improve administrative personnel quality, raises the high level and short talented person in order to provide safeguard of human resources for protection and management in the Libo karst nominated sites. Educational training includes working with license; to actively introduce into talented person, promote intercommunion and cooperation, strengthen academic education and establish information network etc.
8. Supplementary articles

8.1 Examination and approval of planning

Firstly, the planning passes the accreditation examined by relevant sections and experts which was organized by Construction Department of Guizhou Province and South Guizhou Buyi and Miao Autonomous Prefecture People’s Government; then is reported to South Guizhou Buyi and Miao Autonomous Prefecture People’s Government to accept examination and approval; finally, is filed in by Administrative Office of World Heritage submitted in Guizhou.

8.2 Planning implement

The planning will be brought into effect when South Guizhou Buyi and Miao Autonomous Prefecture People’s Government approve, which will be concretely implemented by Libo County People’s Government and supervised by superior relevant departments of construction, forestry and environmental protection etc.
The Libo Nominated Sites are located in Libo County of South Guizhou Buyi and Miao Autonomous Prefecture, Guizhou Province, China, including Guizhou Maolan National Nature Reserve, Daqikong and Xiaqilong sections of Zhangjiang National Scenic and Historic Interest.
Area of the Libo Nominated Sites
Management Plan

Of WuLong Karst, Chongqing

Administration of Furong River Scenic and
Historic Interest of Wulong County
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1. Summarization of the nominated property

1.1 Location and area of the nominated property

Wulong County, administrated by Chongqing city, is located at the southeastern margin of the Sichuan Basin. Situated at the transitional zone of Dalou mountain, Wuling Mountain and Guizhou Plateau, Wuong is the gorge part of the lower reach of Wu River, which is one of the anabranch of the Yangtze River. The geographic coordinate of Wulong county is N29°02′00″-29°40′14″, E107°13′16″-108°04′34″. Wulong County neighbors east to Pengshui County, south to Daozhen county of Guizhou Province, west to Nanchuan county and Fuling region of Chongqing city, north to Fengdu county (Fig 3). The extension distance from east to west and from south to north of the Wulong County is 82.7km and 75km respectively; with the total area is 2901 km². Three karst nominated properties at located at the southeast, middle and northeast part of the region (Fig 4). The center coordinates are N29°13′48″, E107°54′12″ (Furong cave), N29°26′15″, E107°47′50″ (Three Natural bridges) and N29°36′09″, E108°00′13″ (Houpingkou Karst doline) respectively. The total area of the nominated properties and their buffer zone is 38000ha (380 km²).

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Coordinate(Central)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furong cave karst system</td>
<td>Jiangkou town in southeast to Wulong county, the entrance of Furong river running into Wu river</td>
<td>N29°13′48″, E107°54′12″</td>
</tr>
<tr>
<td>Three natural bridges karst gorge system</td>
<td>The north of Wulong city, limestone region of Triassic system spreading where Yangshui river (the reach of Wu river) runs through</td>
<td>N29°26′15″, E107°47′50″</td>
</tr>
<tr>
<td>Houping karst doline system</td>
<td>Zhongling village in Houping town in Wulong county</td>
<td>N29°36′09″, E108°00′13″</td>
</tr>
</tbody>
</table>

1.2 Regional Geology

1.2.1 Tectonic and Structure

Geologically, the nominated properties are located at the Yangtze platform, which is a tectonic steady region of the southern part of China. In the late of Pre-Sinian, the Jining
Movement formed a uniform folded basement, which is the early base of the Yangtze Platform. After that, the nominated properties experienced several tectonic movements from the Cambrian to the Cenozoic.

During the Cambrian and Silurian period, a transgression-regression sediment sequences can be detected in this region, which mainly composed of shallow marine carbonate rock. The rocks are characterized by dolomite rock, dolomite-limestone, biogenic limestone intercalated by sand-shale and mudstone. The thickness of the sediment is nearly 3000m. Guangxi Movement, which happened in the late of Silurian period, uplifted this region to land. The sediment of Devonian and Carboniferous is absent in this region and a full sediment sequence in Permian and Triassic period can be found. The sediment thickness is over 2000m. The Permian sequence consists of shallow-sea, sea-land alternation siliceous carbonate rock, sand-shale rock and coal seam. The Triassic sequence is mainly composed of shallow-marine carbonate rocks intercalated by sand-shale rocks. Indo-China Movement lifted this region to land in the late of middle Triassic Epoch and ended the marine deposition. This region went into platform mobile period in the beginning of late Triassic epoch. Red land facies basin clastic rocks of Mesozoic deposited after continental rifting. The sedimentary rocks of this region (from Cambrian to Jurassic) were folded and fractured by Yanshan Movement and established geologic pattern in this region at the end of Jurassic period. The stratum of the nominated property is composed of anticline (extending from north-south to east-north) and syncline. Carbonate rocks of Cambrian and Ordovician expose on the anticline. But the syncline is composed of the rocks of Triassic and Jurassic. The crust has been lifted intermittently by Himalayan movement since Cenozoic Era, resulting multilevel plane of denudation and incised valley, bringing up various typical karst systems in the nominated properties.

1.2.2 Strata and Lithology

The carbonate rocks of Furong cave and Houping karst doline are developed in Cambrian and Ordovician, but carbonate rocks of Three Natural bridges are developed in middle-lower series of Triassic (Fig 7). The main strata and properties of rocks are described as follows:

(1) Triassic System (T)
Middle series: Leikoupo Formation (T<sub>2</sub>l)

Leikoupo Formation is the middle series of Triassic. It consists of versicolor calcareous shale, silty shale intercalated by marl in the upper part. The lower part is composed of middle-thick bedded limestone containing dolomitic limestone and conglomeratic limestone. It is 561 m thick in total.

Lower series: Jialing River Formation (T<sub>1</sub>j)

The Jialing River Formation is the main karst strata. It is composed of light grey, middle-thick bedded with intercalated thin-bedded limestone; thin-bedded argillaceous limestone; dolomitic limestone and paste breccia. It is 538 meter thick in total.

Lower series: Feixianguan Formation (T<sub>1</sub>f)

Feixianguan Formation is composed of grey to dark grey middle-thick bedded limestone, oolitic limestone intercalated by thin-bedded argillaceous limestone. There are argillaceous limestone and shale internated at the upper and lower part. The thickness is 417m.

(2) Ordovician System (O)

Lower series: Meitan Formation (O<sub>1m</sub>)

Meitan Formation can be divided into three parts. The lower and upper parts consist of versicolored shale, siltstone with intercalated nodular limestone. The middle part is composed of thick-bedded bioclastic limestone. The gross thickness for this formation is 281m.

Lower series: Tongzi + Honghuayuan Formation (O<sub>1t+O1h</sub>)

The upper part of Tongzi + Honghuayuan Formation is characterized by middle-thick bedded biogenic limestone with intercalated a small quantity of dolomite rock; the middle part consists of thick-bedded oolitic limestone intercalated by yellowish-green shale; the lower part is composed of middlet-thick bedded limestones and dolomite rocks, intercalated with siltstones and shales. The total thickness is 286 meter.

(3) Cambrian System (e)

Upper series: Maotian Formation (e<sub>3m</sub>)

The formation consists of the interbed of middle-thick bedded limestone, dolomite
limstone and dolomite rock, intercalated with edgewise, oolitic limestone comprising with cherty nodules. The Maotian Formation is 122m in thickness.

**Upper series: Houba Formation (∈3h)**

Houba Formation consists of middle-thick to thick bedded dolomite rock with intercalated middle-thin bedded argillaceous or conglomeratic dolomite, dolomite limestone. The gross thickness of this formation is 319 m.

**Middle series: Pingjing Formation (∈2p)**

The lower part of this formation is characterized by yellowish and thick bedded dolomite; but the middle and upper part are composed of grey, middle-thick bedded dolomite intercalated with limestone. It is 339m thick in total.

**1.2.3 Hydrogeology**

The water horizon of the nominated property can be classified two essential types basing on carbonate rocks, sandshales and wirelike fold structure. The two horizons are carbonate karst water horizon and sandshale crack non-karst water horizon. The essential qualities of the two horizons are different. Sandshale crack non-karst water horizon often as exotic water supplies water to carbonate karst water horizon that accelerate to develop karst.

The karst water horizon has good secondary permeability and the precipitation infiltrates into it. For abundant exotic water supplying to it, the karst water horizon has the characters of large flux, water level imbedded deeply and continually adapting the drainage datum surface of the region. Ground water moving in the cracks can enlarge the cracks into channels and forming ground water cave at last. The karst water horizon is characterized by epikarst zone, vadose zone, seasonal change zone and phreatic zone from upper to lower. Every zone has different hydrodynamic character and the karst process is active in every zone. Affected by rivers corroding and climate, the thickness for the vadose zone and seasonal zone of the nominated property respectively ranges from 200-800m and 50-100m.

**1.3 Geomorphology**

**1.3.1 Geomorphologic character**
The region of the nominated property belongs to the middle-high mountain and lower mountain in the western Hubei province and the northern Guizhou province. It is located at the transitional zone between parallel mountains in Sichuan Basin and the middle-high mountains of Wushan Mountain and Loushan Mountain. The land is incised by Wujiang and its reaches. The incised depth may be kilometer. At the dividing ridge region, the topography main is hill and changes gently. For affected by carbonate rocks and sandshales, the character of topography is different from the character of geomorphology. The region of carbonate rock spreading consists of half-baked Fengcong Karst or Cone Karst. The Cone Karst is characterized by doline, depression and dry valley. The altitude of the region ranges from 165m to 1800m. Majority parts are 900-1200m height.

Wulong karst system consists of three unattached systems such as Furong cave and Furong river karst system, Three Natural bridge karst system and Houping karst doline system. They developed at the mechanism of the Yangtze Gorges crust lifted since Neogene. They are significative carst system in the world.

Furong cave and Furong river karst system is located at Jiangkou town in southeast Wulong County and neighbors to the entrance of Furong river running into Wujiang river. The karst system developed on the carbonate rock of Cambrian and Ordovician. It is composed of Qikeng cave, Shuairen cave, Weijiangling cave, Dongba cave, Xinlukou cave, Shuilian cave, Furong cave, Gangan cave, Sifang cave and Furong Gorges. The caves are all spreading on the right bank of Furong river except Shuilian cave and spreading from the top of plateau through valley slope to the valley bottom. The elevation ranges from 1162m to 180m. The relative elevation of the caves is close to one kilometer. In this cave system, the caves’ channels whose elevation is over 800m and lean to bank are vertical. Qikeng cave is the deepest vertical cave among the detected caves in China at present and the vertical depth is 920m. Dongba cave neighboring to Qikeng cave is the second deep and it is 656m deep. The caves whose elevation is less than 800m are main transvers caves, such as Shuilian cave, Furong cave, Gangan cave and Sifang cave. We can find similarity in other vertical caves. The length of Furong cave is 2846m. The size of the cave is grandiose and there are so many various speleothems and cave minerals in Furong cave that we have not found in other caves in China.
Three Natural bridges karst gorge system is located at Baiguo town in northern Wulong county and on the limestone of Triassic where Yangshui river runs through. The types of karst geomorphology are rich and colorful, rare and typical. The types include surface river gorge which was captured about 14.5 kilometer, caves, several unprofitable and indraught karst cave mouths, karst doline, natural bridges and karst springs. Natural bridges are composed of Tianlong bridge, Qinglong bridge and Heilong bridge. The gorges are 200-400m deep. Yangshui gorge and Longshui karst suture gorge are the most splendid among the gorges. Karst dolines include Qinglong karst doline, Shenying karst doline, Zhongshiyuan, Xiashiyuan, Haziyan, Meiziao, Hejiatuo karst doline, etc. Caves are composed of Xianren cave, Longquan cave, Baiguo swallet stream cave and captured caves such as Seventy-two fork cave, Shuangmen cave and Monkey cave. Springs comprise of Qingtian spring, Shenying spring, Fog spring, Three-layer spring, Thread spring, Pearl spring, Sanchao shengshui multi-tide spring, etc.

Houping karst doline system is located at Houping town in the northeastern Wulong county. The karst system developed on limestone of Ordovician and composes of Qingkou, Cattle Nose, Shiwang cave, Daluodang, Tianpingmiao and underground caves such as Erwang cave and Sanwang cave. Houping karst doline system is relatively peculiar and rare on the world because there must be special geologic geomorphology and hydrogeology to develop scouring karst doline system.

1.3.2 Geomorphic evolution

The geomorphology pattern of the nominated property was formed after Yanshan Movement. The crust was lifted again by Yanshan Movement. The geomorphology of this region has evolved for three phases under the endogenetic action and epigenetic action:

1. Higher Plateau Phase: The most archaic geomorphology of the nominated property is at Yangtze Gorges and is named E’Xi period geomorphology. It was developed about in the late of Mesozoic to Paleogene when the surface was denuded and leveled for a long time. At the period, the highlands were denuded, the billabongs were filled and the surface turned into gentle hilly landform. At present, there leaves some rudimental landforms which spread in the region of high watershed, such as the top of Xiannu Mountain, the rudimental peak of the watershed at the both banks of Furong River. The
altitudes most are over 1500m. Because the geomorphology has been diastrophed and denuded for a long time, we identify it difficult now. The planation surface was lifted that related with Himalayan Movement. There is no direct connection between the geomorphology of Higher Plateau Phase and shaping three karst systems of the nominated properties.

(2) Hilly Plateau Phase: Hilly Plateau Phase is an important phase of developing geomorphology. Since Eocene Epoch (5.7 Ma), Indian Ocean Plate has dived toward north, producing vigoroso northsouthward compressive power so that Tibet Plateau was fast uplifted and Himalayan Mountain was formed. We name the tectonic movement as Himalayan Movement. Himalayan Movement is divided into two phases or three phases. The early Himalayan Movement occurred in the late of Eocene Epoch to the middle of Oligocene. It not only shaped the grand rudiment of Tibet Plateau but also destroyed the planation surface of Higher Plateau Phase, formed new folds and fractures. After Himalayan Movement, the surface turned to relatively steady and lasted to Pliocene. The climate was wet and hot in this phase. The surface of Hilly Plateau Phase which we can find today was formed by the active fluvial erosion, chemical weathering action and karstification. It is composed of large-scale basins and dales, spread at the watershed. The altitude is about 1200m. At the region of karst, there is particular shallow burden karst landscape. The karst landscape is not prominent and typical on the surface. But there developed ferociously karst system underground. The geomorphology of Hilly Plateau Phase was ended at the late of Pliocene and the lower limit time is about 2 million years ago. The three karst systems of the nominated properties began to develop roundly.

(3) Gorge Phase: Himalayan Movement occurred from the late of Pliocene of Neogene to the early of Quaternary period and lasts to today. Himalayan Movement is characterized by frequently tectonic upliftinged alternated with transitory relatively steady phase and cold climate alternating with warm climate. The landform is not characterized by wide and gentle planation surface of Higher Plateau Phase and Hilly Plateau Phase, but is characterized by river undercutting action. At the beginning of the movement, the wide valleys were formed on the river banks at the region of Three Natural bridges and perfecter drainage systems were formed at the region of Furong River running. The
process occurred at the early of Pleistocene. A strong tectonic movement occurred after the process in Guizhou province which strengthened the large-size and large-range gradient uplifted from west to east and unequal fracture on Guizhou Plateau. The region of Wulong had met with the corresponding tectonic movement. At the process, the landforms formed in Higher Plateau Phase and Hilly Plateau Phase were uplifted to different altitudes, rivers began to undercut the surface of Hilly Plateau Phase. The depth of undercutting Wujiang River and its reaches is over 500 meter. Because the platation surface that formed in Hilly Plateau Phase has been intermittent uplifted since Quaternary Period, the terraces developed on the banks of surface river, the flow direction of underground river has been changed for several times. Swallet stream and multilayer caves have developed time after time and resulting natural bridges, gorges, karst dolines on the surface and complex configuration caves underground. The climate changed cold and warm by turns, glacial age and interglacial age came forth in Quaternary. It is important to develop geomorphology. Accumulation was happened in rivers and collapse was happened in caves in the cold and dry glacial age. The streams undercut and chemical sedimentation was active in caves in the relative warm interglacial age.

Although the climate changed cold and warm by turns in Quaternary, the climate was not affected by ice cap of Quaternary. The karst geomorphology formed in Neogene (or more archaic) was conserved well. Karst vestige such as natural bridges, caves, karst dolines and gorges developed larger and perfecter by cooperation of surface and underground karstification along with new tectonic uplift in Quaternary.

1.4 Climate

The nominated property area is located mid-subtropical humid monsoon climate region with mild climate, abundant rainfall and obvious four seasons. The average annual temperature is 17.9°C and the annual average precipitation is 110.5mm. The dry season and wet season are quite distinct from each other. The precipitation is concentrated in May to October, Occupying 70% of the whole year’s. The annual average humidity is 78%.
1.5 Hydrology

In Wulong County the main surface-water system includes the anabranch called Wujiang River, from Yangtze River’s south bank, and the other water systems. The rivers associated with heritage-nominated area mainly include Furong River (a tributary of Wujiang River), Yangshui River and Muzong River. Furong River, an incised-gorge river, is the biggest tributary of the lower reaches of Wujiang River, whose source is in Guizhou Plateau. Its drainage basin has the length of 160km in a direction between south and north, fall height of 110,8m, average gradient of 4.79‰, and average discharge of 166m³/s. Its annual average discharge is 5.23×10⁹m³, and the high water season is in April to October, whose discharge occupies 84% of the total.

Natural Three- Bridge Karst Gorge System, is situated on Yangshui River, and is 26km long with average runoff depth of 813.3mm. The region where the river flows and limestone distributes becomes dry valley (wadis) owing to groundwater’s capture.

Houping Tiankeng Karst System is the water source of Muzong River. At the source there is Mawan Kave Spring, whose high and low discharge is 1-30m³/s.

It is worth pointing out that, all the surface-rivers have the character of deep-cutting in this area, and the situation goes straight to the source, and forms equally thick layer of packing gas in the limestone stratum. The characteristc has great significance, which promotes in forming many kinds of Karst.

1.6 Biology Species

1.6.1 Plant

In Wulong Karst nominated property area, the animals and plants, especially near Furong Cave and Furong River are the most important. In the area, the rivers cut deep, and the climate is warm and humid, the lithological character landform types are complex and diverse, the population is sparse on the valley. All these create many different kinds of habitats for the growth of the vegetation. Therefore, there are a rich variety of plants, plenty of vegetation type, and a great many of special and decorative plants.

There are vascular plants 139 families, 375 genera and 558 species near Furong Cave and Furong River. Among them, there are 56 species Pteridophyta, belonging to 32 genera, 19 families; 12 species Gymnospermae, belonging to 11 genera, 8 families; 490 species
Angiospermae, belonging to 332 genera, 112 families. It shows that in this area the plants are various, which is rare in the similar natural environment in calcareous rock area.

The vegetation types are diverse, including: warm needleleaf forest, evergreen broadleaf forest, deciduous broadleaf forest, shrub and grass bunch, bamboo forest, bamboo and shrub bunch, grass patch and so on. It dictates that the area has zonal character which evergreen broadleaf forest propsers. The variable vegetations produce plant landscapes which have different scenes. In addition, the vegetation’s aspection change is obvious. In spring and early summer, the jade green background is embellished with red, yellow and violet flowers, which is a blaze of colour and full of joys of spring. In high summer, it becomes oily green. In autumn and winter, the red maple leaves, the pyracantha fruit, the nandina fruit, the red oranges, the yellow quercophyllum leaves, the gingko leaves and the dark green leaves matches so that the scenery gets gorgeous and exquisite.

In Natural Three-Bridge Karst Gorge Area, the vegetation is classified to mid-subtropical humid evergreen broadleaf forest. The primary vegetation has been destructed because of man’s activities, and now mainly the secondary vegetation exists. Most of it is warm needleleaf forest, shrub forest or shrub and grass bunch. The vegetation in spatial change is remarkable, and to some degree, the aspection becomes different. There are some species on National Key Protection Plants List: Ginkgo biloba, Eucommia ulmoides, Taxus chinensis, Handliodendron bodinieri, Liriodendron chinense, Juglans regia, Phellodendron chinese, Fagopyrum dibotrys, Cinnamomum cam phora, Camptotheca acuminata, Actinidia chinensis, Gynostemma pentaphyllum.

1.6.2 Animal

In the valley zone along Furong River, the mountains are high and slopes steep, the forest makes good ground cover, and man’s activities have little influence on here so that this area becomes a reservation and shelter for wild animals. In this area, there are abundant animal species, altogether 237 species, among them, fishes 64, bird 108, beasts 47, and amphibious reptiles 19.

Furong River Area is a key region for protection and research of our country’s biodiversity. There are rich variety of rare and valuable animals, including 5 species for
Class protected animals of nation: Manis pentadactyla, Neofelis nebulosa, Trachypithecus francoisi and Aquila chrysaetos; 19 species for Class protected of nation: such as Macaca mulatta, Manis pentadactyla, Cuon alpinus, Prionodon pardicolor, Viverra zibetha, Viverricula indica, Proteles temmincki, Moschus bereaoskii cavbangis, Lutra lutra, Martes flavigula, Aix galericulata, Milvus migrans, Symaticus reevesii, Chrysophalus pictus, etc. There are 18 endangered species of animals in international trade stipulation protection name list, such as Panthera tigris, Manis pentadactyla, thoracica, Paradoxornis webbianu. Some communities has a high value on traveling and sightseeing, like Trachypithecus francoisi, Macaca mulatta and Phasius Colchicus community, Garrulax canorus, Leiothrix, etc. 64 species of fish distribute in Furong River, including 33 endemic species in China, accounting for 50%. Thus, some birds, such as Chrysolophus pictus, Symaticus reevesii, Garrulax pocilorhynchux be rthemyi, Pycnonotus sinensis, Spizixos semitorques, Bambusicola thoracic,and Paradoxornis webbianus, are also endemic species in China.

Trachypithecus francoisi is traditionally named black monkey, orgreen monkey, rare and precious in China, and Class protected animal in our country. Two crowds were discovered twice in Furong River Gorge On Nov 24th, 1993 and Jan 31st, 1994. The number of them is quite small. Each small group has 3-5 monkeys, gathering and becoming a big group also only has 8-10 monkeys or so. The monkeys mainly distribute in Zhuzi Brook and Xianba River on the right bank of Furong River. The monkeys were discovered in Xianba River. The space to seek food is narrow and they live on tender leaves and buds.

Macaca mulatta named yellow monkey is Class protected animal in our country. According to the first investigations, there are approximately 300 ~400 monkeys in Furong River Valley. The biggest community has about 90 monkeys, generally 30 ~ 50. The active space of Macaca mulatta is rather wide, may be divide into 4 ~ 5 groups:
from Huaxi Power Plant to Guanyintai to Laohaokou group, Houshan group, Jianzishan to Xuanba to Yanganshan group, Furong Cave to Tianxing Qun, Sifangjing to Panguhe group.

In Furong Cave and Furong River, 109 species of birds are known and they belong to 14 orders, 33 families, 78 genera. Aquila chrysaetos is the species of the first class animal for protection in our country. It mostly inhabits and reproduces on the high cliffs near Huaxi Power Plant in Haokou Town. When it is sunny, they soar and hunt down animals like lambs as their food.

In Natural Three-Bridge Karst Area, it has the feature of high mountain steep slope, dense forest, and abundant animal resources. The wild animals have mammals 7 orders, 17 families, 47 species, reptiles 2 orders, 20 families, 28 species, amphibians 2 orders, 7 families, 20 species, birds 15 orders, 39 families, 174 species, fishes 7 orders, 8 families, 34 species. Spiders, butterflies, and other animals are found in Qishiercha Cave. Even bats are found in which the place is about 5,000m far from the mouth of the Fairy Cave. Tadpoles and blind fishes are also discovered in such caves which have water, as Longquan Cave and the Fairy Cave, etc. Living in such dark environment, their eyes have seriously degenerated, the whole body have become transparent, and their body color also get light so that it is easy to see their internal organs and skeletons, etc.

1.7 Population

In the end of the year 2004, the statistic has shown that the number of the residents in the nominated property area is 3,940, 23,993 in the buffer zone, the total 64024.

Table 1-2 Estimated number of population in the nominated property and buffer zone

<table>
<thead>
<tr>
<th>Nominated area</th>
<th>Number of population in nominated property area</th>
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<tbody>
<tr>
<td></td>
<td>Core zone</td>
</tr>
<tr>
<td>Furong Cave &amp; Furong River Karst System (section)</td>
<td>1850</td>
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</tbody>
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2. The principle, basis, object and goal of the protection

2.1 The principle

2.1.1 Protection first

Firstly, we should establish the concept that preservation is the start of the protection. The karst landscape and the precious wildlife are the precious natural heritage, and its integrity and the authenticity must be well protected. It is premise of all works in the inheritance place. Therefore, the relations of the tourism resources exploitation and the ecological environment protection must be correctly treated to guarantee the karst landscape, the vegetation and the ecological environment are not destroyed and the quality of the air and water do not severior.

2.1.2 Sustainable development principle

The sustainable development should harmoney the population, social, the economical, resources and the environment developing in phase, take does not sacrificing the benefit of the offspring as the premise, while guarantee the environment and the resources sustainable using. Any exploitation of Wulong Karst Inheritance nominated area must follow the sustainable development principle, enable the tourism resources obtain the full exploitation and use. Meanwhile, the exploitation can maintain sufficient coordination and uniformity with the environment. Each plan implementation of the nomination is a dynamic system, the plan must be advantageous to gradually constructions and implements, continuously development, and places the protection firstly.

2.1.3 Give prominence to the principle of the keystone and the characteristic

The value and the landscape attraction of the inheritance place is decided by the particularity of the prominent value karst landscape. Consequently, the plan must put
emphasis on well protecting and fully displaying the characteristic and the superiority of the resources.

2.1.4 System coordination, comprehensive planning principle

Each area of the nomination place is a characteristic and integrated karst system and forms the unique comprehensive space respectively. The relations of each part (subsystem) must be coordinate commendably. Specifically, the idea of the entire drainage (surface water and ground water) should be applied during coordinates the relationships between various subsystems and different drainages.

2.1.5 Ecology care principle

The ecological environment is most important natural background of the inheritance place. Good ecological environment and high-grade environment quality is not only one of the important prerequisite of protecting karst landscape commendably, but also the driver that scenic spot maintenance formidable attraction.

2.1.6 the principle of harmony the relationship between the economical development and environment protection

In the nominated property and the buffer zone, the plan must correctly deals with the relationship between inhabitant’s economical development and the inheritance protection. From current protection practice, the local community inhabitants participate in protection should be carried out. By guiding them to take part in the protection related works to obtain the source of the life needs income. Meanwhile, raising their protection consciousness will reduce the economy dependence on local biological and land resources, which will benefit to the protection of the nominated property.

2.2 The basis of plan establishment

Founded on the investigation and evaluatuion of the karst landscape of the nominated property place, the plan rest on the Chinese scenic spot and the national geology park related laws and regulations. All the plans should study other country’s national park scientific plan principle and follow the world inheritance protection joint pledge, which will ensure an advance plan. This plan bases on the following laws and regulations, standard and documents:
Due to the advantageous conditions of the climate, the geology and the geography,
Management Plan of WuLong Karst, Chongqing

various geological forces, such as the fluvial, karstification, gravity, shaped the karst geology and landform, which had very high watching value and scientific research value, during the geological time in the Wulong Karst Inheritance nominated area. They are including: The natural bridge, Karst Cave, Karst canyon, Tiankeng, Shaft sunk, Duochaquan spring, swallet spring, Karst depression, Funnel, stone hills, columns and so on. There are many extremely precious karst landscapes, which has the international significance or the top class of the domestic, in these leaving behind non-renewable geological relics.

The main protection objects are: The natural bridge group, Furong Cave and Tianxing town shaft sunk and cave group, Furong Jiang canyon, Tiankeng group, Baiguo geologic gap shape canyon, Karst spring and so on. There are different protection missions for the three subareas of the Wulong Karst Inheritance nominated area.

2.3.1 Furong Cave Furong Jiang Section

The important karst landscape in the Furong Karst Cave-Furong Jiang sector, which includes Furong Karst Cave, Tianxing Shaft sunk and Karst cave group (Qikeng cave, Tongba Karst cave, Xnilukou Karst cave, Shuiliandong Karst cave etc), Furong Jiang canyon, and the precious wild life in both of Furong Jiang banks constitute the main protection objects together.

(1) Furong Cave

Furong Cave is a large-scale corridor type limestone cave, there is 2392m cave with huge space, every cave secondary chemic deposit shape is respectively dazzling and colorful, especially the non-gravitational water deposition shape still is rare in the world at present for its widespread distribution, pure quality and perfect shape. It is more rare in the nation and world that the canine shape calcite crystals, raft stalagmite, aragonite crystal frost, gypsum flower and antler helictite which is forming in the basin. So it is a underground artistic palace and scientific museum which is worthy of the name, while it has very high tourism value and scientific research value, so that it may enter into the row of the finest cave in the world. The huge act and fast running waterfall, the origin of life, the coral basin, the greatest gypsum flower, the canine shape calcite crystals and gypsum flower cave which it hasn’t opened to outside at present, which not only is Furong
Cave characteristic representative, also is the most main protection object.

It is worthiness, which the cave environment system from original relative close, independent and stable system has changed to receiving the jamming, half opening system along with the opening tourism of Furong Cave, cave environmental factor such as air current, humidity, temperature and so on have been changed, caused the cave landscape having any degree variation. Moreover there were scattered bedrock collapsing and stalactites falling in the cave. These disadvantageous signs have aroused correlative department notice. It is a actual urgent task that protects Furong Cave practically. Furong Cave protection divides into following several aspects:

First, the stability of Furong Cave. The stability of Furong Cave should be monitored further, and the advance alarming system should be established. Monitors the stability of the cave wall rock and the growed stalactite class around it, the collapsing and the sliding probability of the wall rock, the falling and the collapsing of the stalactite class and so on, consequently guarantees the safe tourism of Furong Cave.

Second, the cave environment protection. In attention to monitors the change of the main environment factor in the hole, including cave air temperature, humidity, CO2, positive and negative ion, wind, nition and its consistency; the essential factor of the water (dropping water, running water, water of basin) such as temperature, PH value, conductance. Based on analyzing the mass obtaining datas, understands space-time change of the various essential factors in the cave environment system; observes and analyses environmental variation and the cave self-cleaning ability cause for the different quantity tourists enter cave, namely observes and analyses the antijamming ability of Furong Cave environment system, determines the maximum quantity of the tourist in the precondition which guarantees the high-quality cave deposit.

Third, the protection of the secondary chemic deposit in the precious cave. Monitors the water quality and the hydrochemistry ingredient change in the main basin in order to keep the water nature. Gets to the bottom of the main cause which the cave landscape degenerates, discusses the protection plan of the cave landscape, does experimental research for repairing Furong Cave landscape, then achieves the sustainable development and continued use forever of the resources.
Fourth, the protection and restoration of the vegetation above the top of Furong Cave, the implementation takes back from agriculture returns the forest.

(2) Tianxing shafts

There are a great deal of shafts (karst pits) in Tianxing area, which located at upstream of supply region of the Furong cave shares the typical hydrology geology setting with Furong cave. Many shaft caves, such as Qikeng cave, Dongba cave, and Xinglu Kou cave are widely distributed here. The Qikeng cave, with the total depth is 920m (the top elevation and bottom elevation are 1162m and 242m asl respectively) and total length is 5.88km, is the deepest vertical shaft caves that have been probed. Besides these cave shaft groups, there are many funnels, valleys in this region. They are closely related with Furong cave’s formation, evolution process and need special protection. The major protection works include: 1) protection of cave shaft groups; 2) vegetation and environment protection. The vegetation condition, water discharge and polluted or not are directly affect the environment and landscape of Furong Karst cave.

(3) Furong Jiang gorge

The Furong river canyon is not only important Karst landscape, but also the important tourism resources. In addition to take attention to protect canyon itself, we should pay special attention to geological vestige as follows:

(1) The Cambrian strata, which has been incised nearly 1km, is deposited 0.5 billion years ago. From which many geological phonomon can be found such as strata plane, the crevasse, the fold and the avalanche. Those unique geologic structures form a significant landscape.

(2) Two special stone hills, which are named as “big stalagmite” and “small stalagmite” respectively, distributed in this region is the symbol of relic corrosion landform. Meanwhile, the small-scale rock sight is formed by microgeomorph landscape, which is constituted by the special rocks in the river or bank.

(3) About dozens of waterfalls, which is formed by the Karst springs and the seasonal surface water on the cliff banks of Furongjiang River, have different discharge and shape. The Longkong waterfall, about 5m widths, is the biggest of them and a subtorrent’s exit on the canyon valley wall.
(4) Outside cave stalactite: Under the biological participation, there are the great amounts of tufas on the both cliff banks, which constitute biologic Karst landscape. Some of them hang on the disks; others grow on the rocks with different shapes.

(4) Zoology and botany

We must protect the vegetation of Furong river canyon. Generally speaking, vegetation in the Furong Jiang canyon is well, which not only effectively reduces water and soil erosion, but also plays very good role in scenery. It intensified foil and strengthened the karst landscape in this region. In the canyon, the dominated landscape is the cliff, the narrow river valley, and the current of water. The vegetation covered in the cliff further strengthened the entire canyon’s landscape, which showing not only the magnificent but also the quite and beautiful. The special plant and groups in Furong jiang is characterized by subtropical vegetation. There survive many kinds of rare and precious animals, such as Presbytis, Francois, Macaca, Mulatta and so on, which take the forest or brush as the dwell and multiplication place. Protection of the canyon area’s plant will also effectively protect these rare and precious animal resources.

2.3.2 Karst Gorge and Three Natural Bridges

The physiognomy landscapes of section area of Three Natural bridges karst gorge are abundance and centralized distributing, from the core of Three Natural Bridges and Tiankeng which locate in, radiating to Middle Stone Yard Tiankeng, Bai Guo earth fissure style gorge, Sanchaoshengshui multi-tide spring, among which the main objects to protect are Three Natural Bridges, tian keng, dry valley, cave, karst spring, earth fissure type gorge, etc.

(1) The Gorge And Natural Bridges

Three natural bridges which featured by giant dimension, distribute one after another and extend 1.5km in Yangshui river valley in the section area of Three Natural Bridges karst gorge, which are the biggest dimension natural karst bridges and very rare, extremely precious karst landscape that have been discovered and reported in the world. In order to utilize the world wonder continuously, we must protect it particularly.
Firstly, protection of ecosystem environment, up to now, not only the tremendous current which shaped the Natural Bridges in the past has filtered into underground by and large, but also the main groundwater stream no longer under the Natural Bridge cluster yet, therefore the surface water flux is scarce, and the whole feature of the whole Natural Bridges landscape would be weakened once without the surface current, so protection of surface current in every possible way appears extremely important. Secondly, protection of Natural Bridges themselves, constructing other more buildings is forbidden, and such destroying behavior as firing an artillery section to dynamite is also prohibited, in order to prevent the Bridge body from collapsing and being destroyed by contrived factors. Thirdly, we should pay attention to the stability of steep cliff of gorge’s banks, defend and reinforce the points betimes where danger probably occur, set up precaution signs, make sure they are well protected, and guarantee the tour security.

(2) Tiankeng

The primacy are Qinglong Tiankeng, Shenying Tiankeng, Zhongshiyuan Tiankeng, Xiashiyuan Tiankeng, and the secondary are Dashiyannao Tiankeng, Goatacave(Sanwangcave) Tiankeng, Hejiatuo Tiankeng, etc. Qinglong Tiankeng and Shenying Tiankeng alternating distribute with Three Natural Bridges, all these together constitute an infrequent landscape of Three Natural Bridges; Zhongshiyuan Tiankeng, whose upside opening area is 27.8×10^4 m^2, has been regarded as the second largest in upside opening area in the world at present, and at the bottom of which there are terrace landscape and farmer yards, which are easy for tourists to access and conveniently for tour exploiture. Something must be done to take good care of the original feature and surrounding vegetation. It’s not allowed to mine mountain stones near the Tiankeng or to construct any buildings without programming.

(3) Karst Spring

The most important is suspending spring such as Sandie spring, Yixian spring, Pearl spring, Fog spring, etc, and Sanchaoshengshui muti-tide springs. The dynamic variety and water quantity of the spring are directly controlled by status of supply area. Water quantity
of Sanchaoshengshui muti-tide spring follow the rule that varies regularly and periodically, if the vegetation ecosystem environment in the spring’s supply area were destroyed, the most important attribute will possibly disappear or being weakened consumedly, thus loses its tourist value. Therefore, it is especially important to protect the vegetation ecological environment of its supply area.

(4) Baiguo Fissure Shaped Karst Gorge

Baiguo fissure type karst gorge include the earth fissure type gorge of Baiguo upstream lurk stream entrance, caves of the lurk stream segment and Longshuixia earth fissure type gorge at the lower reaches of the lurk stream exit, the most important is The ‘little Natural Bridges which was made up of Feitian suspending waterfall, downstream gorge, collapsed rock, etc. The key points of protection: firstly, protection of the vegetation ecological environment of gorge’s bottom and surrounding, not to add artificial buildings at will; Secondly, we should pay attention to the stability of the steep cliff of gorge’s banks, defend and reinforce the points betimes where danger probably occur, set up precaution signs, make sure they are well protected, and guarantee the tour security. Thirdly, protection of water source which include two aspects of water source (water volume) and water quality, water of the fissure type gorge valley is clear enough to see bottom, rill year to year, which adding some nimbus to the gorge, therefore we must pay attention to protect the vegetation ecological environment of supply area.

(5) Cave

Within the section area of Three Natural Bridge gorge karst Xianren cave, Longquan cave, Qishiercha cave, etc are main objects to protect. The key key protection of Xianren cave is its water source and environment, for it is a lurk stream pattern cave, the surface stream which descends to dry ditch from the upper reach flow into cave directly, some rubbish often can be seen in flowing water, being carried into the Xianren cave, causing pollution, we should attach importance to protect the existent problem. There are many cave cultures whose whole body is transparent such as blind loach, toad congener, big tadpole and so on, they must be protected particularly, We should pay attention to protect
the Qishiercha cave, which is an important site to study the ancient hydrology characteristic for its position is higher, the era when it coming into being is comparatively remote, and the loose accumulative deposit at the bottom of the cave is thicker.

2.3.3 Houping Tiankeng Section

Geological vestiges such as Tiankeng cluster of scouring and denudate pattern, cave system, karst spring, gorge, stone forest, stone column, etc, which belong to karst section area of Houping Tiankeng are the main objects to protect. As core of karst landscape, the Tiankeng cluster together with surrounding caves, karst spring, gorge, etc, constitute an integrity and various developing phase karst system, which covers from non-karst zone to karst zone, from surface to underground, from upstream to downstream, from supply area to drainage area.

(1) Tiankeng Cluster Of Scouring And Denudate Patter

Tiankeng cluster of surface water scouring and denudate pattern is made up of five Tiankeng includ Qingkou Tiankeng, Shiwangcave Tiankeng, Tianpingmiao Tiankeng, Daluodang Tiankeng and Niubicave Tiankeng, which is the rare karst landscape in China, even rare in the world dimension. Therefore, we should attach much importance to protect it. Firstly, to protect the rock of the Tiankeng’s bottom and cliff wall, strictly to prohibit quarrying mountain stone; secondly, to protect the vegetation inside or outside of the Tiankeng which has scenery-making function, even have it closed to breed it, strictly forbid to deforest; thirdly, not to construct buildings near the Tiankeng so as to keep its original feature.

(2) Cave System

Tiankeng of scouring and denudate pattern is main site to absorb ground surface water, caves developed under which are centralized channel to collect the flowing water, such as ERwang cave, Sanwang cave, Mawan cave and so on which lie under the Qingkou Tiankeng, they are main carriers that contain such information as the development, evolvement of the Tiankeng and the tectonic uplift movement of the earth’s crust, and
possess the significant academic value in scientific research, moreover, some caves(such as Sanwang cave) whose deposit landscapes are abundant, having higher Appreciation value and the exploration value. So the caves of the section area should be well protected, Under the circumstance of haven’t being developed at present, we had better seal the cave entrance with iron barrier so as to prevent the secondary speleothems from being destroyed.

(3) Karst Spring

Mawan spring, which is the main spring in the section area, classified as big karst spring, which is the total exit of the groundwater in the distribution region of Tiankeng. As a integrated hydrological and geological unit, Mawan cave spring region, which has explicit boundary of drainage basin and conditions of supply, pathway, drainage, play a significant role, for it is the main geological vestige to understand about the dynamic force of the Tiankeng’s development. And now, with the completion of hydro-electric power station in Mawan cave spring, rising water have submerged the mouth of the spring, Objectively play a role of protecting the mouth of spring, so it needn’t specially protection. The main protection object is the ecological environment, especially vegetation in the spring’s region, Intact vegetation is the condition that the spring water can be produced continuously, so the vegetation in spring region’s ground surface should be well protected.

(4) Karst Gorge

Yanwanggou karst gorge, whose span and total depth respectively are 2300M and approximately 500m, is the modern gorge type that has single entrance. The surface water in the gorge which is collected in rainy season, gathered into the under-drainage system of Erwangcave from its southern Zaoyanhole. Yanwangditch gorge’s growth have experienced two stages: the wide open plain gorge in early period and the earth fissure-type gorge in the later period. Studying its growth process has vital significance for us to understand the local hydrology and physiognomy’s growth and evolution history. Yanwangditch gorge is featured by deep and shady woods, especially the section which approach Zaokonghole, which is featured by deeply incision at the bottom of which, and standing-like at the lower part of the banks, narrow and steep, having certain appreciating
value, We should perform to protect the gorge, not to cleave the mountain or quarry rocks in the gorge section at will, and pay attention to protect forest and vegetation.

(5) Stone Forest

The pagoda-like stone forest which developed in the west of Houping township is a surface karst landscape which has appreciating value, also is a geological vestige to understand the speed and grow-controlled factors of the karst development, they should be protected, such behaviors as mining stone forest should be strictly prohibited, and the mountain, forest and vegetation which have scenery-construct function also should be protected.

2.4 Protection Goal and Protection Significance

2.4.1 Protection goal

Firstly, natural landscape resources in Wulong Karst nominated property should be strictly protected and reasonably developed according to the world inheritance protection joint pledge, the scenery scenic spot area and the national geology park related laws and regulations, to implement the policy of "strict protection, uniform management, reasonable exploitation, continual use", then under the uniform management of management structure in scenic spot. Secondly, it should be strengthened of its scientific research, reasonably used of its scientific value and esthetics value, powerfully enhanced of its use level. Thirdly, the boundaries and all levels of protectorate’s scope about the nominated property and buffer zone should be scientifically determined, to protect the landscape’s integrity and spontaneous’ combustibility, to protect integrity of the surface water system and the underground hydrology system. Finally, the Wulong Karst nominated property should be as far as possible to become the important base in world where we can carry out some spiritual and cultural activities such as the Karst scientific research, the education and enlightens, the tour leisure and so on, to become the landscape to be exquisite and become the natural heritage in world where the environment, social and the economy coordinated develop and become the place where enjoy a good global reputation under the protection premise, as the same time we have the responsibility to turn over the intact scenic spot having the world natural heritage value for the future
generations.

2.4.2 Protection Significance

(1) Guarantee the Karst scenic resources to continual use

The Wulong Karst inheritance nominated property has many Karst landscapes, mainly has: magnificent TianSheng bridge group, grand canyon systematic, multitudinous extraordinary TianKeng Karst, mysterious cavern and among them its secondary biochemistry settling making one exclaim in surprise, FuRong Jiang canyon and many precious zoology and botany resources among them and so on, they all pass through the nature long-term history to evolve, through they we may read out the very many rare natural recorded information, at the same time they are also produced by which the lithosphere - biosphere - hydrosphere -aerosphere affect mutually to form such characteristic. They are the world-class natural marvelous sights which all pass through a long geologic history time; many kinds of powers factor formed the non-renewable geological vestige under the special advantageous condition. Therefore, these natural landscapes have many unique attributes, they are rare, non-renewable, and not relatively duplication and not transportability and so on, usually they are called as the natural resource which universe has altogether. If we establish Wulong Karst landscape as the world natural heritage property, this action enable them to obtain the practical effective protection, thus not only they will be enjoyed for the modern people, moreover they will be shared for the posterity, continue forever to be used too.

(2) Protect ecological environment of Wulong Karst, protect its rare and precious zoology and botany species

The ecological environment in Wulong Karst inheritance nominated property belongs to Karst ecological environment system, moreover because its is quite frail, the vegetation above it mainly has crag natural disposition, dry natural disposition, grows as an attachment natural and happy calcium vegetation and by clears out punctures the brush to be composed, so if once is destructed, and want to obtain the restoration with difficulty. In the scope of already becoming the nomination places, specially ecological environment basic in FuRong Cavern FuRong Jiang piece area is good, there both has exquisite Karst landscapes and has good vegetation and massive rare, precious animals perch in the region,
for example there has 64 kinds of fish distributes in Furong Jiang, in these fish Chinese unique type achieved 33 kinds, occupy 50%. And there extremely have many kinds of birds such as Chrysolophus pictus L·, Symaticus reevesii Gray, Garrulax poecilorhynchux be rhemyi (D·et O·), Pycnonotus sinensis (Orme lin), Spizixos Semitornes Swihoe, Bambusicola thoracica thoracica Tem·, Paradoxornis webbianus (G·R·Gray) and so on, all of them are the unique type in China. Furong Jiang region is a key area of our country biodiversity’s protection and research, so it is especially important to protect this ecological environment.

(3) Provide a high grade place to use for to travel and sightseeing, promote the local economical development

There mainly has a lot of Karst landscapes which they not only are rare in world but also have extremely high esthetics value with its graceful type and its broad in scale to provide advantageous condition to develop travel and sightseeing in Wulong karst nominated property. Tourist can receive a very vivid scientific inspiration and obtain scientific knowledge through their watch to Wulong karst nominated property because many landscapes of the nominated property itself have the very profound scientific connotation. For instance, industrial structure in this county-wide was adjusted, people who live in Wulong town transformed their thought, the self-consciousness of local people to protect environment and resources was greatly enhanced, good economic efficiency, social efficiency and environment benefit came to reality, all these advantage are obtained because of successful development and construct of FuRong Cavern. The rich zoology and botany resources in the nominated property became a organic constituent of the nominated property, these high grade resources of zoology and botany play the role which cannot be substituted for the humanity to return to the nature, to exercise their body and relax their mind, to take vacation and so on. While appreciating and praising them, the idea of treasuring nature and protecting resources can be transmit into the people with a watching and enlightening way to deeply take the idea of sustainable development in people's minds, to build a fine existing space and tomorrow with abundant resources for our generations after generations, if these natural resources have a high level and scientific development.
(4) Scientifically inspect, research into as well as scientifically popularize the base

Many Karst landscapes in the nominated property of Wulong Karst inheritance are rare landscapes, typical and completely Karst landscapes, thus they have the very high scientific research value, many important and significant topics for research are proposed for both domestic and international geographer, for example, the evolution of landform-hydrology system in Karst, the formation of Tiansheng bridge, the caverns’ origin of shape at special chemical deposition, the type and evolution of Tiankeng Karst and so on are especially important and significant in research field. But there still have many places that are considered to be extremely weak of research and inspection in the nominated property and buffer zone, certainly there will have more new discoveries and more new tasks for the people to explore, study, solve along with the further scientific inspection.

The Karst landscapes in the nominated property and buffer zone will inevitably cause the people’s interest and desire to explore the mystery of nature, become the popular scientific base, become to be the best, the biggest natural classroom to guide the people to enter the gate of the nature and study the nature.
3. Actuality

3.1 Importance and Necessity

Up to 2005, the international heritage list, mainly in Karst landform and cave or something about Karst are 47, in which the international heritage list of Karst and cavern altogether are 10; In which was nominated by other reasons but including the international heritage list of Karst and cavern altogether are 28; Including the international heritage list of Karst and cavern world culture altogether are 9. In all of the international heritage list above, there aren’t any examples like the Wulong Karst nominated property area, which forms and grows under the control of the earth’s famous crust rising of Three Gorges of the Yangtze River area but performances in various ways of cavern, the natural bridge, canyon and Tiankeng Karst system.

The Wulong Karst (Chongqing) Nominated Area satisfies World Natural Heritage criteria (vii) and (viii) among 10 criterion of the world culture and Natural Heritage.

(1) World heritage criteria (vii)

Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

The nominated property is to the Furong Cave, The natural three bridges, Tiankeng Karst and Canyon for representative's three integrated Karst system, which collects home deepest shaft, the esthetics value highest cavern, the world-class scale the natural bridges group, the Grand Canyon whose bottom is dry, the underflow which embezzling the surface river, the world rare natural bridge group and so on each kind of unusual, rare Karst landscape to a body, and the nominated property s Show the multilayer space in the face of land and underground, the collection Karst phenomenon and the nature unusual and wonderful accomplishing, which gives people that cannot take it all in, the strange taste coming up in great numbers and from all sides natural beauty enjoying, is the most unique natural beautiful scene and the important esthetics value area in the areas of South China Karst.

(2) World heritage criteria (viii)

Be outstanding examples representing major stages of earth’s evolutionary
history, including the records of life, significant on-going geological processes in the
development of landforms, or significant geomorphic or physiographic features.

Three Karst systems formation and the growth of the Wulong Karst nominated property has involved the geologic history up to now about 540 million years from Cambrian period, the geology evolvement before Neogene period, which has provided the basic geological condition for the Wulong Karst, the earth's crust uplifting and the terrain, the landform evolvement since Neogene period, which has become the three Karsts' typical system demonstration the platform of Wulong. They have respective system integrity, which is under the identical earth's crust rise mechanism identical geological rise mechanism common control, under the different concrete geology, the topographical condition the Karst phenomenon different manifestation, which forms the type of different Karst system, thus vividly records and displays the Earth to develop this stage earth's crust ascent characteristic and its concrete characteristic.

The tunnel of Furong Cave system, takes 450-500 meters elevation as, above 700 meters takes hangs to the growth as a characteristic; Below for hangs to with crosswise takes turn, which explained the earth's crust ascent movement nature by continuing ascent to transform for shakes the type rise.

The cavern channel reversion incline phenomenon of Houping Tiankeng karst system, and it explained the entire Karst system which forms in the earth's crust ascent process.

The natural three bridges Karst gorge system is the best illustration, and it is marvelous sight of the world Karst landform and nowadays the character which retains in the surface and the underground cavern that explained it has the complex formation, the evolution history. Its complex river valley of upstream, the disappearing current of the water-dunnel, upside the width Valley wall and lower part the canyon Valley wall cavern which demonstrated the different time the fluent direction, the natural bridge base approximate wadi present situation, the formation of Baiguo underflow and the capture to surface river system, on the Karst ground water runoff belt nearby many Tiankeng formation, the appearance of Wu River Bend to flow mouth and so on to compose a complete Karst hydrology--landform system and the evolved system, and between them both has the very good spatial distribution rule, and has in the time the successively
production, the development sequence may track down, which is a condition unequalled Karst natural museum and the scientific research natural test base on the Earth.

3.2 Present state of conservation

3.2.1 Receives the protection legally

At present, the Wulong Karst inheritance Nominated Area has been National Scenic and Historic Interest and National Geological Park, it is protected by National Laws and Regulations, such as 《Constitution of the People’s Republic of China》, 《Forestry Law of the People’s Republic of China》, 《Environmental Protection Law of the People’s Republic of China》, 《Water Law of the People’s Republic of China》, 《Provisional Regulations of the People’s Republic of China Concerning the Management of Scenic and Historic Interests》, 《Law of the People’s Republic of China on the Protection of Wildlife》.

3.2.2 Efficient management system

The management structure of the nominated property area is perfect, its personnel disposes reasonably, and the finance source has the guarantee, in under national construction ministry, Garden Bureau of Chongqing city, the People’s government of Wulong county, etc correction organizations management, administration of Furongjiang Scenic and Historic Interest of Wulong county was built. Under this administration are office, planning and construction section, protection section, the labor division with individual responsibility, mutually coordinates, each work marches into the standardization and legal.

3.2.3 Definitely boundary, protection plan has being impended

The three sections of nominated property area have been compartmentalized definitely, and buffer area provides scenic protection and environmental protection of nominated area, the area of Furong Cave —Furongjiang is 280 square kilometers, Karst landscape is well protected, Furong cave had been opened on May1,1994, the planning and protection measure are the first-class level among the same kind of caves in china; in 2000, the master plan of Furongjiang Scenic and Historic interest was passed the
evaluation, and declared to the People’s government of Chongqing city. The people’s government of Wulong county had been announced “about the practical protection of Furong Cave and natural resource of Furongjiang Scenic”. Although the piece area is huge, but the core partial inhabitants are comparatively few, on some steep slope farming of Tianxing area lies in remit water district of Furong Cave first will be returned for farming to forestry.

The section of the natural three bridges gorge Karst canyon covers an area of 62 square kilometers, which has been already considered as "the geological vestige protectorate" by the People's Government of Wulong County, and was sent by the government circular form, which current situation of protection was good. The natual three bridges Scenic area had been opened on May 1, 2000, which was exploited and protected according to 《Scenery Scenic spot Area Act of administration》 strictly. Partial land sectors of the main scenic area, have been constructed the stockades, plants in the scenic area were protected together by the scenic area and the local resident, and the operator pays the local farmer for forest compensation to undertake the responsibility of the protection ecological environment together.

The section of Houping Tiankeng Karst covers an area of 38 square kilometers, which takes the Tiankeng group as well as the complex buried river, the cavern system as the main Karst landform landscape. At present the position of this section is remote, few people, and the traffic condition slightly misses, which is precisely because this area has not been developed at present, therefore is apt to impending on protection and scientifically, reasonably exploitation in next step.

3.2.4 Monitor work is relatively complete

Wulong Karst nominated property area has been built monitoring indicator systems accordingly, dynamic observation and timely control have been impending on cave environmental, number of visitors, air and quality of water, forest fire, resources population of rare animals and plants.

3.2.5 Complete maintenance very good, and has the certain scientific research foundation.
Kasrt landscape (the cave, the natural bridge group, Tiankeng, canyon) which are the most outstanding value in Wulong inheritance nominated area and the completion of natural environmental are well protected. Since ancient, the natural three bridges (Dragon bridge three holes in ancient times) and Sanchaoshengshuiduochao spring (Three Chaoling water in ancient times) are two places of interests in old Peizhou. In Furongjiang basin, there are few people to live and its traffic is difficult and dangerous. Therefore, the major of nominated areas all remain in the natural condition, and they are influenced very little by human activities. These rare natural heritage have the higher ability to go against wind, such as the Tiansheng bridge groups, Tiankeng groups, then they have been protected very well.

In 1992, the relevant department had inspected the traveling resources and the water resources of Furongjiang. The Southwest normal university had submitted 《Furongjiang of Sichuan Section Traveling Resources and Traveling Development Plan》 in 1995, which provided concerning first material about geology, landform, biology, traveling resources of Furongjiang. The profound recognition about natural background of the Furongjiang canyon section, which has provided a good scientific foundation for Furongjiang's development. The people's Government of Wulong County had announced, "about practically protects the Furongjiang scenery scenic spot resources the circular" in July 1993.

The Furong Cave was discovered by the farmer of in Jiangkou town nearly, Wulong County nearby on May, 1993, which was received the strict protection immediately .Entrusted the Chinese Academy of Geological Science Karst research institute of geology to carry on the comprehensive inspection immediately, to study and to develop the plan design work."96 Wulong International Caverns Symposia and the China Geological Society Cavern Research Board Third Session of Annual Meeting" was held in Furong Cave in 1996. It not only deepened Scientific recognition about Furong Cave, but also caused the idea about the protection of Furong Cave into all levels of management thought deeply. Consequently, country union preliminary examination team ,including
China, England, America, Russia arrives at Wulong county many times during 1994 to 2005 to carry on the geological science inspection, and discovered many cavern of significant scientific value, such as Tiankeng groups, the shaft group etc.

At the same time, many scientific research, the teaching and the production unit of the Chinese domestic all have done the massive foundations work in Wulong Karst nomination area successively, and have finished the detailed geological inspection report and the master plan, and many achievements of plan and the research report have been published. So mastered the natural background, the environment condition of nominated area and the quantity and the value of the Karst landscape resources comprehensively, and make nomination land management and protective solid scientific foundation.

3.3 Threaten and Stress

3.3.1 Pressure of Development

The nominated place of inheritance is located in more remote mountain area and canyon district, Population scarcity, Production activity of Agriculture lack, About 66 people per square meter of population density, Residents inside the area of buffer are Relativity few at present, About 75 or so people per square meter of population density. Currently many places of buffer area belong to translating from farmland into forest, Agriculture activitis are decreasing little by little, The areas of plant trees in the continuous extension, Which Powerfully promote protection work and ecosystem systems of the scenic area to directly development of positive cycle. Because the reservoir was set up and made residents decrease in Furong river's canyon area, which is advantageous to protection of animals of dying out and habitats.

On the other hand, Because Establishment of the hydroelectric station of Shangjiangkou in Furong river, The lands inside the reservoir area is subjected to drown, A handful of location appears new agriculture to opened up,Plant was certain destroyed. Some infrastructure construction,such as Highway, Development of the small town and establishment of the hydroelectric station of Jiangkou results in certain sense of vision influence to nominated place and Buffer landscape area.

3.3.2 Pressure of Environment
Subjected to the influence of tradition produce and life style in the local residents, Plant in the nominated place of inheritance and the Buffer area was once threatened greatly, Along with establishment of the scenic area, consciousness of Protect was improved and ecosystem Agriculture was expanded, The kind of environment pressure was already alleviated consumedly now.

There is no Pollute industry enterprises in the nominated place of inheritance and the Buffer area, As a result the total quantity of the environment atmosphere and body of water are relative better, At the same time, The population density is small in the nominated place, the pollution to the atmosphere, soil and body of waters of the place is very small.

Big parts of region in the nominated place belong to protection regions of different property(scenery famous area of National class, National geology park),where have already been protected well, the influence of mankind’ activity is small, The nominated place of inheritance is not subjected to pressure of environmental.

3.3.3 Natural disaster and reply to risk

There may appear of Natural disaste in the nominated place of inheritance : Collapse, landslip, Flood, Mudslide, karst collapse, Earthquake, Forest fire and so on, the personnel's training system have already built up, The trains of consciousness and measures against disasters should be Carried on, Prevent and reduce disasters are programmed actually

(1) Collapse
The main natural landscapes are placed in the relatively stable state but because Caves, Natural bridge and Tiankeng steep are all very big geology body, Function of Collapse is unavoidable. The hole bottom of the Furong cave piles up a great deal of geology body, After 1994 the tour cave were opened to public, There have been 3 times of collapse because of parts of unsteady on top of the cave, In 2003 earthquake was educed because of storing water in the hydroelectric of jiangkou and resulted in pieces of the stalactite fall inside cave. To this circumstance, Investigative valuation of stability of
Furong cave have already carried on, and homologous measures were adopted. Three Natural bridges and lots of steeps and Tiankeng are more stable, There have not taken place collapse obviously till now, But we should know of, the possibility of collapse still exists. At present measures have already adopted, The person taking charge of safety to strengthen inspection tour and the monitor to the risk rock, The risk rocks appear in parts of body, reinforce, remove danger, and insure the visitor's safety. There is a little amount facilities was set up on top of three Natural bridge region, under which there is river and Tiankeng, Special attention should be payed it, In steep region which may produce the stone of risk and roll and endanger the visitor's safe, The protection net or protection walls must set up to keep stones from falling. At the same time, We Should reduce facilities of service and visitor's activities to insure intact conservancy of the Natural bridge

(2) Mudslide, landslip

Somewhere in the nominated place of inheritance, such as the roads of the Furong cave landscapes were constructed in the region of canyon, mountain High and slope steep, more curved ways, When the natural disasters such as torrential rain or earthquake take place, They probably cause to landslip and mudslides. To prevent from mudslide, Firstly plant trees to forestation, intercepts to decline water and alleviate volume; Secondly Necessary engineering measures are adopted, such as spray oar to protect, block, open up a path and so on

(3) Flood

The nominated place of inheritance locates upper reaches of river, the threat of flood is not big, but there are some tour activities, especially the visitors of natural bridge landscapes region (including longshui canyon) carry on in the river valley, there is possibility influence of the flood disaster. The tours of Houping qingkou Tiankeng and Erwangdong exists the same problem. Therefore, in the tour activity of the raining season, we should be on guard flood to come suddenly in order to avoid endangering visitor's safety.

(4) Earthquake
Earthquake is the result of inside motive of geology function. According to 《The districts diagram of The Chinese earthquake intensity (1990)》, the basic intensity of earthquake in the nominated place of inheritance is VI degree. Since historical records, there have not taken place big harmful earthquake. The influence intensity of Earthquake happened around the nominated is all smaller IV degree. After stored water in the hydroelectric Jiangkou, it has induced several small earthquake. In order to guard against the earthquake disastrous, firstly monitor work is done well. Secondly in the course of engineering design and construction, the anti-earthquake strength standard should be above 5 classes.

(5) Forest fireproof

Under the condition of nature (thunder and electricity etc) and artificial, Forest Fire disaster sometimes is educed. We should pay attention to it. Forest fire watch-tower should be constructed in appropriate position area of forest intensive and high topography. Try hard to form strong forecast, watch from a distance, keep apart, communication and the fire prevention system that fire extinguisher mechanize and specialization of extinguishes fire troops; Efficiently of forest fireproof specialized organization should be established and strengthened. Provided with joint defense troops of the forest fireproof to guaranteed. Various measures of fire prevention are put into effect.

3.3.4 Pressure of tour

The last ten years, there are about 100 thousand visitors in the Furong cave Furong river's scenic area every year. In the last five years the visitors vary between 70 thousand and 90 thousand in natural three bridge canyon scenic area, fewer than visitor’s capacity value. The visitors of the biggest capacity in a year in these locations are above million people, even in visitor's peak period, currently visitor's number reach the capacity standard of the day. There is no area of life service established in the nominated place, no accommodation and dining, Visitors linger about 2 hours or so in each scenic area. In the near future the visitor's quantity will not exceed visitor's capacity. But taken from long-term, because of narrow of tour roads and limited of the Furong cave in natural bridge scenic area, instantaneous visitor's quantity must be restricted, we should formulate measures to deal the pressure that the visitors in high peak date bring.
In view of visitor's quantity is lower than visitor's capacity recently, at present there no find soil harden because of such as foot path, The environment inside the hole change importantly, Cherish organism resources is subjected to threaten, Trave resulted in forest fire and so on. At least in recent few years The suitable tour activity will not give cave, natural bridge, Tiankeng, body of water and mountain bigger effect in the nominated place.

4. Protected Subarea

4.1 Character of the nominated property

The Wulong Karst nominated property have been given the honor of National Scenic And Historic Interest in May 2002 by State Department of China. A year later (2003), it was denominated National Geological Park by Country Resource Department of China.

4.2 The extension of the nominated property and proposed buffer zone

The Wulong Karst nominated propertyt is composed with three parts: the correlative area of Furong Cave-Furong Jiang which is located in the southeast of Wulong County; the area of Three Natural Bridges gorge karst locating in the central section of the county and the correlative area of Houping Tiankeng Karst in the northeast of the county. Each part of them is separated along the north and south bank of Wu Jiang (Attached drawing 4) The area of nominated property is 6000 ha and that is 32000 ha in proposed buffer zone. Total area is 38000 ha (Table 4-1).

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Area (ha)</th>
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| Furong Cave---Furong | Jiangkou Town located at southeast of Wulong county | Area of nominated property: 3000ha  
Buffer zone: 25000ha |
4.2.1 The correlative area of Furong Cave-Furong Jiang

Total area of this region is 28000 ha. About its extension, the riverway of Furong Jiang within Wulong County will be as the principal axis. South from Haokou Village of Haokou Town in Wulong County, north to Jiangkou Town, the span is over 31 km. Longitude is 107°47′E—107°57′E; Latitude is 29°02′N—29°15′N (Attached drawing 8). The highest mountain in this area is Yang’an Mountain. Its altitude is 1510 m by contraries the lowest altitude is 180 m where is the confluent area of Furong Jiang and Wu Jiang. The maximal relative altitude difference is 1330 m.

The extension of buffer zone is south from the district confines of Wulong County, North to the line of Jiaozi Ding—Erdeng Rock—Yinjia Rock—Bayan Jiao. The mountain standing by both side of Furong Jiang will be as the boundary from east to west with about 10-16 km width. The regionalism is include many villages and towns of Wulong County, such as Jiangkou, Shi Qiao, Hao Kou, Tian Xing etc. Besides that, there also have few villages of Pengshui County, for example, Longxiang, Ganxi etc. The total area is 25000 ha except the area of nominated property.

The extension of nominated property is 3000 ha. Surrounding by the center of Furong Cave, shaft caves of Tianxing and downriver gorge of Furong Jiang is powerstation of Jiangkou—XinLukou—Tianxing—Qi Licao—Shuilian Cave—Sanhekou—Yueliangshan such circle areas.

4.2.2 The correlative area of Three Natural Bridges gorge Karst

The area of Three Natural Bridges gorge is located at northeast of Wulong County, about 20 km far from it. Just on the side of the road from Wulong to Fairy
Mountain. And have a distances of 15km far from the South-Grassland Fairy Mountain. Total area is 6200ha. Longitude is 107°45′E—107°51′E; Latitude is 29°23′N—29°29′N (Attached drawing 9).

The extension of buffer zone is east from escarpment on the east side of Shangshiyuan, and along the ridge to the line of Meizitang—Sanchaoshui—Caiba—Baiyanjiao—Jianfeng Mountion. South from Jianfeng Mountion to Boxianglin where is have a distances of 1km far from the south exit of Longshui Gorge. Southwest is arrive at the near of Tunao Mountain, along the road to Old Houses. West to Old Houses—Yuanzibu—Wayaowan—Tangba. It is the north confine and have about a distances of 1km far from north riverbank, along the cliff of lee cave, Mazong Mountain, extend eastward 500m near Shangshiyuan, including all the main sight of Karst in this Gorge Karst system. Total area is 4000ha except the area of nominated property.

The extension of nominated property is 2200ha. Surrounding by the center of Three Natural Bridges, Tiankeng Karst of Zhongshiyian and Longshui Fissure-like Gorge of Baiguo is Houzitao—Dashi Mountain—Hetao—Houtouwan—Sanchaoshui—Wangjiaba—Boxianglin—Dalong Cave such circle areas.

4.2.3 The correlative area of Houping Karst Tiankeng Karst

Houping Karst Tiankeng Karst is located at northeast of Wulong County. Exactly in the drainage area of Mawan Spring in the west of Houping Town. Total area is 3800ha. Longitude is 107°58′E—108°02′E; Latitude is 29°34′N—29°38′N (Attached drawing 10).

The extension of buffer zone is approximately making the watershed in the drainage area of Mawan Spring as the pale. North from Dajin Mountain—Baiyanjiao, south to the headstream of Muzong River and the exit of Mawan Spring. East from government of Houping Town and Tianchiba, west to Dajin Mountain—Hejiawan. Total area is 3000 ha except the area of nominated property.

The extension of nominated property is at the edge of Erwang Cave—Dashi Slope—Tuyu Spring—Liangzishang etc. Including the five top-drawer sight of Karst in Tiankeng-Karst system of Houping: QingKou, Niubizi, Daluodang, Tianping Temple and Shiwang Cave. They are all erosive Tiankeng Karst. Besides that, there are also include
some Cave system that is closely interrelated to the form and evolution of Tiankeng Karst. Such as Erwang Cave, Sanwang Cave and Gorge of Yanwanggou etc. Total area is 800 ha.

The definitely define about the extension of the nominated property and proposed buffer zone in Wulong can make the landscape of karst which have outstanding universal value to keep the integrated natural environment, hill features and drainage area system. It can also protect the distinctive resources of natural landscape effectively and ensure it to have better visual effect. Furthermore, because the relatively few population and limited human action related to this area, the ecosystem in the extension of this nominated zone have a better maintenance accordingly. The natural characters meet adequate reflection.

4.3 The partition of functional section

The method to divide functional section in property zone of Wulong Karst operate around the following key principles:

----- UNESCO in 1972 ‘Convention concerning the Protection of the World Cultural and Natural Heritage’ Article 4: Each State Party to this Convention recognizes that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage referred to in Articles 1 and 2 and situated on its territory, belongs primarily to that State.

----- UNESCO in 1972 ‘Recommendation concerning the Protection, at National Level, of the Cultural and Natural Heritage’ General principle:

**Article 7:** As the ultimate purpose of protecting, conserving and presenting the cultural and natural heritage is the development of man, Member States should, as far as possible, direct their work in this field-in such a way that the cultural and natural heritage may no longer be regarded as a check on national development but as a determining factor in such development.

**Article 8:** The protection, conservation and effective presentation of the cultural and natural heritage should be considered as one of the essential aspects of regional development plans, and planning in general, at the national, regional or local level.

----- In 2001 ‘Regulations of Chongqing City Concerning the Management of Scenic and Historic Interests’ General principle:
Article 4: The scenic and historic interest area must stick to the policy of conservation, unified management, rational exploitation, and continued utilization.

Article 7: All the relational administration ought to perform the responsibility of themselves according to the convention and try every possible way to manage the daily job of Scenic And Historic Interest cooperating with the superior department and administrative organization in this area.

Consulting to those documents and according to the actual condition in the nominated property of Wulong (Chong qing) Karst, then can carry out the partition and protection of functional section. Seeing that the main protective section is a geologic sight of Karst with the characteristic of larger dimension, distributing at different section and relative steady, so the nominated property of Wulong Karst can be divided into the core scenic area and the important scenic area. The buffer zone can be divided into ecology conservation and environment protected areas, service and reception area and regular area.

4.3.1 The core scenic area

This section refer to the distinctive natural landscape area where has the top-drawer grade and according to the standard of World Natural Heritage.

The key point of programming in the core scenic area is: The natural scenic exist in this area must be protected strictly. The most significant protective section is: Furong Cave, Qikeng Cave, Three Natural Bridges and Tiankeng Karst among it, Tiankeng Karst of Zhongshiyuan, Gorge of Yangshui River where the Natural Bridges is located, Fissure-like gorge of Longshui, Qingkou Tiankeng Karst of Houping, Erwang Cave, Sanwang Cave, etc. Serious protections shall be given to the natural landscapes of the core area, including valley, gorge, and water quality and quantity of the underground rivers, etc. Both sloping sides of Furong Jiang Gorge is the major room where the valuable and rare animal move around, so the protections of natural environment in this area must be strictly. It is strictly forbidden to alter the original physiognomic and geological formation caused by human being. It is also strictly forbidden to mine, quarry, and irrigate.

4.3.2 The important scenic area
This section refer to these natural landscape distributing area where have the character of unreproducible and having the value of most science, aesthetics and tourism, but haven’t reach to the standard of “World Outstanding”. It is close to the core scenic area together with which compose the nominated property.

The most significant protective section is From Furong Jiang—Pangu River to Gorge of Furong Cave including the section upwards both sloping side; Dongba Cave, other shaft caves of Tianxing such as Xinlukou Cave, etc; swallet stream of Baiguo; Xianren Cave, Qishiercha Cave, Longquan Cave, etc; Tiankeng Karst on the east and southwest side of Natural Birdges; some erosive Tiankeng Karst on the upriver of Erwang Cave and Sanwang Cave, gorge of Yanwanggou, etc.

Although the import of those landscape can not compare with the Three Natural Bridges, Furong Cave, Qing Kou Tiankeng Karst, Erwang Cave, Sanwang Cave, etc, but they are also infrequent natural landscape, and is a significant section of the whole Karst—hydrology system. They are significant protective section too because they have unsubstitutive function at the aspect of exploring development and evolution history of lithosphere on earth.

The key point of programming in the important scenic area is: the essential of programming in this area is basically be the same with the core scenic area, only slacken off the strict degree appreciably. There are a spot of residential area in the important scenic areas, so it must to control population as many as possible. The existing buildings and constructions that are inappropriate for the scenery ought to be torn down or reconstructed. Strictly control the constructions of the residential area, and develop ecological agriculture.

4.3.3 Ecology conservation and landscape environment protected areas

This area has a large extension, including the mountains, riverheads around the nominated property. Ecology conservation area is refer to those forestry which biocenosis and enironment has less disturb from human activity; geomorphy landscape has definite worthiness; consistent to the quondam state or have the potential of renew the quondam enironment. There is habitat of the valuable and rare animal. Ecology conservation area in the buffer zoon is mainly among the Scenic And Historic Interest of
Furong Jiang and Houping area, there are a lot of valuable and rare propagation. Less population lead to a nice ecology conservation. There are also a large range of landscape environment outside of the Natural Bridges area.

Ecology conservation area ought to inextensio protect the existing ecosystem and zonal vegetation. Close the hills for afforestation especially to the brush-fire secondary forest and human forest according to the programming of vegetation foster and afforest. Striving to recover the quondam zonal vegetation in a mountainous area of calcific rock; protecting all the quondam object and geomorphy. It is forbidden to mine, quarry, fall trees, destroy woods, and hunt animals; constructions are not allowed except for the protection facilities; certain amount of tourism activities are allowed and there are limitations that only planned tour routes are allowed to open to visitors.

The primary role of the scenic and historic interest areas is to protect water quantity and quality of riverheads, especially the upriver water quality and quantity of Natural Bridges scenic area and Furong Jiang.

4.3.4 Service and reception area

The selection of the service and reception center base should be discreet, which shall be constructed in accordance with the conditions of local natural environmental and economic development, avoiding excessive pressure to the local environment which may have negatively impact on scenery resources. The service and reception center shall be set up in Wulong county instead of in the heritage nominated area of Wulong Karst. Jiangkou Town which is located at the confluential area of Furong Jiang and Wu Jiang shall take on the subsidiary function of reception. In the extension of buffer zone, Jiangkou Town has existed some foundational facilities located at dowriver area of Furong Jiang--Furong Cave nominated property. It will not bring a negative effect to the environment of nominated property area only through restrict the excessive increase of tour service facilities and population strictly.

4.3.5 Regular area

Regular area is the other region except the above-mentioned function area. It principally includes the rural area and other agricultural land such as farmland and orchard. Although the value of landscape in this area is not very prominent, but it is still a
significant section of the whole landscape of Karst. Such point hereinafter must take a
specially attention: Protect the basal farmland especially in cultivatable land of Karst area
where the cultivatable land is comparatively limited; safeguard the natural environment
of village, for example, Tiankeng Karst of Zhongshiyuan and its village is a typical
landscape having the perfect combination of nature and culture; It is forbidden to directly
damage and indirectly disturb to the scenery resources and forbidden to blindly mine,
quarry and hunt; land use and construction density and cubdge rate shall be strictly
controlled; the dimension, style, color of the construction should have civilian feature and
can easily form the rurality harmonious with the local environment; improve on the
structure of agriculture production, develop ecological agriculture actively, improve the
economical benefit, strive to assort with tourism of landscape.
5. Monitor System

5.1 Measure indicators

The main natural property of the area of nominated property is composed of the ancient and tough terrane, and have a very high and opposite stability, as long as expel a large-scale sabotage function, all can maintain itself stability basically. The Karst landscape is the special and natural property that the nature gives mankind, and it has the region structure of the multilayer, the on the ground or underground, the all karst landscapes especially can't rebirth. Opposite in other resources and environments, the resources and environment of the special area of karst express a larger flimsiness and sensitivity. As to any changes of forming environmental conditions all may cause the important variety of the landscape.

The most important natural property in the area of nominated property constitutes the karst hydrology-geomorphology system each on the space, and has a relation successively on time. The endogentic that form them is beyond control of the mankind, but the exogenetic mainly is the dissolution function and the erosion function .leaving of the water and the flowing water, there have no the emergence of these natural property, and changing movement path, the water quantity and quality of the flowing will influence the function of the karst hydrology-geomorphology system, to weaken ,to change or to suspend the process of karst function, and make the natural property be injured seriously.

The most obvious example is the Furong Cave, at first we should be sure that the protection of the Furong Cave is highly effective from the ten years, but the speleothem of the Furong Cave is too delicate, so it is sensitive to the environment change specially. After exploiting the Furong Cave, broking through entrance and exit to the cave cause the change of the cave weather condition (such as the air current condition), and have already made the pond water deposition be influenced certainly. The protection of Furong Cave is divided into both sides, one is the environment inside the cave and the rare cave secondary chemical sediment, the other is the hydrology geology unit where the cave locate in, namely ecological environment of the catchment area and the cave (Ponor) protection, the condition of vegetation and the quantity of flowing, and whether to be polluted all influence the change of the cave environment directly. Therefore we have to monitor the factor itself of the cave environment
and the condition of ponor cluster, doline and vegetation in Tianxing village that place on the Furong Cave, and then can protect the natural property availably.

<table>
<thead>
<tr>
<th>Sequence number</th>
<th>Item (indicator)</th>
<th>Period</th>
<th>Location of record</th>
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<tr>
<td>1</td>
<td>Quality and quantity of surface water</td>
<td>Aperiodicity</td>
<td>Environmental Protection Bureau of County, Water Conservancy Bureau of County</td>
</tr>
<tr>
<td>2</td>
<td>Quality and quantity of underground water</td>
<td>Aperiodicity</td>
<td>Environmental Protection Bureau of County, Water Conservancy Bureau of County</td>
</tr>
<tr>
<td>3</td>
<td>The atmosphere quality (in 5 places)</td>
<td>Aperiodicity</td>
<td>Environmental Protection Bureau of County</td>
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<tr>
<td>4</td>
<td>Dynamic monitoring on community of rare animal</td>
<td>Aperiodicity</td>
<td>Forest Bureau of County, Administration of Furong Jiang Scenic and Historic Interest of County</td>
</tr>
<tr>
<td></td>
<td>(Presbytis francoisi)</td>
<td></td>
<td>Forest Bureau of County, Administration of Furong Jiang Scenic and Historic Interest of County</td>
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<tr>
<td>5</td>
<td>Ecological environment (Mainly in Furong Jiang)</td>
<td>Every season</td>
<td>Forest Bureau of County, Administration of Furong Jiang Scenic and Historic Interest of County</td>
</tr>
<tr>
<td>6</td>
<td>Biodiversity and dynamic change of propagation</td>
<td>Every year</td>
<td>Forest Bureau of County</td>
</tr>
<tr>
<td>7</td>
<td>Environment in Furong Cave</td>
<td>Automatic monitor</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of County, Institute of Karst Geology</td>
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<tr>
<td>8</td>
<td>Quantity of visitors</td>
<td>Everyday</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of County, Tourism Bureau</td>
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<tr>
<td>9</td>
<td>Fire disaster</td>
<td>Everyday</td>
<td>Forest Bureau of County, Administration of Furong Jiang Scenic and Historic Interest of County</td>
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<tr>
<td>10</td>
<td>Collapse rocks (Furong Cave and Tianshengsanqiao)</td>
<td>Patrolling on surface, periodic check in major region</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of County, Institute of Karst Geology</td>
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<tr>
<td>11</td>
<td>Population and land Using states in the nominated areas</td>
<td>Two Years</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of County, Tourism Bureau</td>
</tr>
</tbody>
</table>
5.2 Basic type of monitoring

5.2.1 Regular monitoring

We usually monitor the quantity and quality of surface water, quality of atmosphere, and pollution source in the fixed-point, so as to understand its dynamic change and change regulation, to get the abnormal information and to give a processing in time.

5.2.2 Underground and surface water monitoring

The focal point of monitoring is that the dynamic change of underground river, quality of underground water and level change of underground water in raining season. Surface water mainly is the water quantity and quality change of reservoir, river, rivulet, ponor and underflow.

5.2.3 Rare animal, living environment and vegetation monitoring

Recording to dynamic change on community of rare animal, biodiversity and living environment, and monitoring the dynamic change of living environment and vegetation.

5.2.4 Touring monitor

Evaluating and statistic to the tour environment in scenic area of the nominated property periodically; Analyzing tourist source and dynamic state of tourism market; Analyzing the tour cost-benefit; influence on the tour activity to landscape, water, propagation and ecological environment; monitoring to the integrity and safety of the primary facilities in the scenery spot.

5.2.5 Patrol monitoring

Opening patrol in order to discover, stop and eliminate the hidden danger and disasters of the fire, collapse rocks and so on, and doing an early warning to avoid disasters in time.

5.2.6 Capacity monitoring

When the visitor number exceeds the maximum of capacity, we should adapt the step of canalling, scattering visitors.

5.2.7 Community monitoring

Monitoring the condition of social and economic of the nominated area and peripheral inhabitants, the realization to significance of property protection and the exaltation degree of
participation of self-conscious and conservation consciousness, specially concerning the population of the nominated property and the buffer zone and change of land use, and noticing influence of the project of social and economy development involving the region of the nominated area to resource protection.

5.3 Results of previous reporting exercises

<table>
<thead>
<tr>
<th>Name</th>
<th>Contents</th>
<th>Complete</th>
<th>Publication or Location of records</th>
</tr>
</thead>
<tbody>
<tr>
<td>The integrated planning of Furong Jiang Scenic and Historic Interest</td>
<td>Analyzing completely the condition of natural environment, geomorphology, propagation, physical tourism resources etc. and having a integrated planning to Scenic and Historic Interest</td>
<td>Institute of Gardens and Architectural Planning in Chongqing</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of Wulong County</td>
</tr>
<tr>
<td>Tourism resources and tourism exploitation and plan in Sichuan part of Furong Jiang (Chongqing)</td>
<td>The type of tourism resources, geomorphology characteristic, propagation etc. are elaborated completely by investigating</td>
<td>The People's government of Wulong County, Department of geography in the southwest Normal University</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of Wulong County, Department of geography in the southwest Normal University</td>
</tr>
<tr>
<td>Report on integrated survey of Karst Geology Park in Wulong, Chongqing</td>
<td>Dissertating the geology background and the primary characteristic of geological relic of Karst Geology Park in Wulong, and having a comparison and evaluation both inside and outside the Country, and discussing their form condition and process.</td>
<td>Institute of Karst Geology, Academy of Geology and Science in China</td>
<td>Institute of Karst Geology, Academy of Geology and Science in China</td>
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<tr>
<td>Formation and evaluation of the characteristic of geological relic of Karst Geology Park in Wulong, Chongqing</td>
<td>Expatiating the distribution, basic characteristics, form conditions and process, comparison and evaluation, exploitation and protection etc. of geological relic of karst geology park in Wulong, and discussing deeply on Furong Cave.</td>
<td>Chen Weihai, etc.</td>
<td>Geology Press, rock in Chinese Institute of Karst Geology, Academy of Geology and Science in China</td>
</tr>
<tr>
<td>The integrated planning of Karst Geology Park in</td>
<td>Summarizing the characteristics of tour resources in Geology Park, analyzing deeply the exploitation conditions of</td>
<td>Geology Park of Sichuan province, Survey and</td>
<td>Administration of Furong Jiang Scenic and</td>
</tr>
<tr>
<td>Project Description</td>
<td>Responsible Institution/Person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wulong, Chongqing</td>
<td>Evaluation Center of geological relic Wulong County</td>
<td></td>
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<tr>
<td>Investigation and evaluation on the stability of Furong Cave in Wulong County, Chongqing</td>
<td>Institute of Karst Geology, Academy of Geology and Science in China</td>
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<tr>
<td>Report on environmental influence of Jiangkou Power Station in Furong river, Chongqing</td>
<td>Science institute for Protection of the Yangtze Water Resources</td>
<td></td>
<td></td>
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<tr>
<td>Implemental project of research on landscape protection of Furong Cave</td>
<td>Administration of Furong Jiang Scenic and Historic Interest of Wulong County</td>
<td></td>
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<tr>
<td>Implementation on ponor cluster in Tianxing village and Erwang Cave, Sanwang Cave in</td>
<td>Institute of Karst Geology, Academy of Geology and Science in China</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The exploiture principle of touring cave and exploiture practice of touring Furong Cave</td>
<td>Zhu Xuewen, Karst in China, 1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yangtze Caves</td>
<td>Andy Eavis et al, Administration of Furong Jiang Scenic and Historic Interest of Wulong County</td>
<td></td>
<td></td>
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<tr>
<td>Exploration on ponor cluster and Erwang Cave and Sanwang Cave of Houping in Tianxing village, Qikeng Cave is the first vertical deep Cave in China at present.</td>
<td>Erin Lynch, The red rose Cave Club of Oxford university</td>
<td></td>
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</tbody>
</table>

Note: Wulong, Chongqing refers to landscape resources, market analyses and developmental foreground, programming and the trend and direction of development, and have an overall discussion and dissertation to Furong Cave.

Evaluation Center of geological relic Wulong County

Institute of Karst Geology, Academy of Geology and Science in China

Science institute for Protection of the Yangtze Water Resources

Power limited company of Jiangkou, Chongqing

Zhu Xuewen, Karst in China, 1995

Andy Eavis et al

Administration of Furong Jiang Scenic and Historic Interest of Wulong County

Erin Lynch, The red rose Cave Club of Oxford university
5.4 Administrative arrangement of property monitor

Administration of Furong Jiang Scenic and Historic Interest of Wulong County is responsible for monitor job in the area of nominated property, Environmental Protection Bureau, Water Conservancy Bureau, Forest Bureau, Tourism Bureau, Territorial resources Bureau of Wulong County open monitor job under the uniform deployment. As to some high-tech and heavy workload projects, such as professional projects of exploration and protection to underground cave, animals and ecological environment monitoring, etc. We usually complete the monitor and research job together with scientific research unit, junior college and academy by the way of science cooperation.

<table>
<thead>
<tr>
<th>Monitor departments</th>
<th>Address</th>
<th>Post Code</th>
<th>Tel.</th>
<th>Fax</th>
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<tbody>
<tr>
<td>Administration of Furong Jiang Scenic and Historic Interest of Wulong County</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-77713333</td>
<td>023-77713099</td>
</tr>
<tr>
<td>Environmental Protection Bureau of Wulong County</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-77722308</td>
<td>023-77722308</td>
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<tr>
<td>Meteorology Bureau of Wulong County</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-77723207</td>
<td>023-77723207</td>
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<tr>
<td>Forest Bureau of Wulong County</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-77712363</td>
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<tr>
<td>Water Conservancy and Electric Power Bureau of Wulong County</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-77722125</td>
<td>023-77722125</td>
</tr>
<tr>
<td>Territorial resources Bureau of Wulong</td>
<td>Gangkou Town, Wulong County</td>
<td>408500</td>
<td>023-85619567</td>
<td>023-85619256</td>
</tr>
</tbody>
</table>
5.5 Checking and Processing

After establishing the perfect monitor systems and confirming the primary indicators in the nominated property of Wulong karst, the each concerned department will have data collecting and processing strictly according to regulation, obtaining data mainly through observation on the spot, sampling, scientific investigation, indoor analysis, and distilling the macroscopic information on surface and datum of dynamic change by using the modern and advanced science technique means, through the satellite picture and aerial survey data in work.

Checking, accepting and the corresponding amending of the concerned data, are responsible of Administration of Furong Jiang Scenic and Historic Interest of Wulong County. The problems in monitoring are report to Administration committee of international property in Chongqing by Government of Wulong County, so as to obtain accurate processing and solution in time.
6. Management rule of law and safeguard system

6.1 Management rule of law and regulations

6.1.1 Concerned laws

The laws, which is about conserving and managing the legal status of Karst’s nominated property zone of Wulong in Chongqing, include mainly:


Article 9th of the Constitution of the People’s Republic of China provides: “The natural resources such as mineral resources, water, forest, mountain ridge, grasslands, wasteland, beach, all of which belong to national possession, as whole people owning.”

Article 22th, Section 2 provides: “Nation conservs places of historic intertest and scenic beauty, precious historic relic and other important historic cultural property.”

(2) The forest law of the People’s Republic of China passed by national People’s congress in 1982.


Article 17th provides: the People’s government at different levels ought to take steps to protect the typical and all kinds of natural ecosystem zone, the zone dispersed by rare wild animal and vegetable life generally which are in imminent danger, the zone dispersed by famous cave and fossil, natural historic remains such as glacier, volcano, spring, humanity historic remains and ancient trees, in order to prohibt them from being destroyed.

Article 19th provides: Exploiting and making use of natural resources must take measures to protect ecologic environment.

Article 23th provides: The construction of town and county ought to combine the features of local natural environment to protect vegetation, water area and natural landscape and enhance the construction of city’s garden, greenland, and scenic spots.

(5) The historic relics conservation law of the People’s Republic of China passed by national
People’s congress in 1982.

6.1.2 Concerned rule of law and regulations

The concerned rule of law about protecting and managing Karst’s nominated property of Wulong in Chongqing effectively include:


**Article 8th:** The lands of scenic spots aren’t seized by every unit and individual. All scenery and natural environment in scenic spots must be conserved rigidly and can’t be destroyed and changed at one’s ease.

**Article 10th:** In scenic spots important scenery, historic relic and historic site and ancient famous trees ought to be investigated, identified and people make protective measures to organize implementations.

**Article 11th:** According to plan, scenic spots ought to exploit scenic resources positively and improve traffic and service facilities and tour conditions; according to plan, make sure the admitted tourists’ contain and organize the tour activities in planned way. Don’t receive tourists unrestrictedly.

(2) The means of implementing provisional regulation of managing scenic spots issued by the construction department in 1987.

**Article 9th:** The organization of managing scenic spots must rate the work of conserving scenic spots as the most important task.

**Article 12th:** Scenic spots ought to enhance the water’s conservation and management, prohibit the activities that may cause water to be polluted and damaged and forbid using it excessively.

**Article 13th:** Scenic spots must defend the animals’perching environment practically and prohibit people to harm and catch wildlife indiscriminately.

**Article 14th:** The landforms of scenic spots must be conserved sternly and people must prohibit activities such as cutting into moutain, quarrying, digging sand and taking soil.

**Article 16th:** Scenic spots ought to be kept original natural and historic scenes. Prohibit to go in for large-scale construction and go on activities about changing landforms and natural environment in scenic spots. Prevent the scenic spots to have artificial and citified tendency.

(3) The law of forest and the type of wildlife’s natural protection and management issued by


(5) No.21 command—the regulation of protecting and managing geologic historic site by the Chinese land resources department (original geologic minerals department) in 1995.


Article 4th: The work in scenic spots must insist on the policies of rigid protection, centralized administration, reasonable exploitation, continuous use.

Article 5th: The People’s government above county level ought to enhance the leadership of scenic spots’ work and organize concerned department, according to laws, to do the protection, plan, construction and management work well in scenic spots in order to realize the integration of economic benefit, social benefit and environment benefit.

(6) According to above laws and regulations, Wulong county’s People’s government draft a series of rules and systems about protection and administration:

—The management means of Lotus River national emphasis scenic spots in Wulong county issued by Wulong county’s People’s government in September, 2002.

Article 7th: The management office of Lotus River is in charge of general investigation about the resources in national emphasis scenic spots of Lotus River, with departments such as forestry department, environmental protection department and land resources department. They also set up development files, and ought to draft special measures for the emphasis protective objectives such as particular geologic historic site, rare animal and vegetable life generally and ancient famous trees, and implement protection effectively.

Article 9th: Forestry department in county ought to do well work such as closing hillsides to facilitate afforestation, withdrawing cultivated land and returning forest, planting trees to make green, reforming forest. Protect forest and vegetation and the environment of wildlife species’ reproduction, growth and perching well.

—The means of managing traffic safety on water of Lotus River national emphasis scenic spots issued by Wulong county’s People’s government in August, 2003.

—The job responsibility of united enforcing law groups of Lotus River scenic spots issued by

6.2 Plans related to nominated property zone

(1) 《Chongqing’s national economy and social development ninety-five- plan and long-range objective in 2010》

(2) 《City integrated plan of Chongqing》

(3) 《Tourism development outline of Chongqing》

(4) 《Tourism integrated plan of Chongqing》

(5) 《The tenth of five-year-plan on tourism development of Chongqing》

(6) 《Integrated plan of Wulong county》 (2001)

(7) 《Tourism development integrated plan of Wulong of Chongqing》 (2004-2020)

(8) 《Wulong county’s national economy and social development ninety-five- plan and long-range objective in 2012》 (1996)

(9) 《Wulong county’s national economy and social development fifteen-plan and long-range objective in 2017 (2001)

(10) 《Tourism exploitation integrated plan of Wulong county, which is worked out by city development research institute of Chongqing’s academy of social science (in December, 2000)

(11) 《Tour resources exploitation plan of the part of Lotus River in Sichuan》, which is worked out by Wulong county’s People’s government in Sichuan province and the geography department of Southwest Normal University (in January, 1995)

(12) 《Tourism exploitation integrated plan of Wulong Tiansheng Bridge》, Isthmus and Sancho holy water, which is worked out by the center of planning, designing and exploiting cities and towns in Wulong county (in May, 1999)

(13) 《Integrated plan of Baiguo isthmus scenic spots in Wulong and detailed plan of park construction》, which is worked out by Chongqing’s academy of constructing, planning and
designing garden. (in March, 2001)

(14)《Integrated plan of Lotus River scenic spots , which is worked out by Chongqing’s academy of constructing》, planning and designing garden, (in January, 2001)

(15)《Integrated plan of Karst geologic park of Wulong in Chongqing》, which is worked out by the center of investigating and evaluating geologic park and geologic historic site in Sichuan. (in February, 2002)

6.3 Management system

According to concerned laws and regulations in Chongqing, management committee of world natural legacy in Chongqing city is set up and seventeen government functional departments at provincial level participate in the management committee. The specific managements for property zone are subordinate to Chongqing’s public landscaping bureau.

The organization for managing Karst’s nominated property zone in Wulong is a management office of Lotus River scenic spots in Wulong county, which is set up by Wulong county’s People’s government. It is responsible for carrying out macroscopic and comprehensive management in the planning scope of nominated zone. Make sure to implementing all the laws and regulations comprehensively. Put all sorts of resources’ conservation in nominated property zone into the orbit of legal system. Carry out systematic, all-round and comprehensive protection and management for ecology such as geologic substances, cave, water and animal and vegetable life generally in nominated property zone. There are ten full-time administrative personnel in the department. And there are also many part-time administrative personnel who pursue managing community’s network in the scope of scenic spots and natural country. They also set up office, planning and construction section and safety protection section, who divide the work, take responsibility and co-operate each other.

Except the management office of Lotus River scenic spots in Wulong county and the working personnel in concerned scenic spots altogether manage and conserve nominated property zone, about ten community inhabitants in the nominated property and proposed buffer zone are employed as part-time managers, who help to conserve landscape and animal and vegetable life generally in every residential area.

Table 6-1 Chongqing city and basic-level administrative setup for Karst’s nominated property zone
<table>
<thead>
<tr>
<th>Order number</th>
<th>Name of setup</th>
<th>Legal basis</th>
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<tr>
<td>1</td>
<td>Administrative committee for world property Of Chongqing government</td>
<td>The regulation of administrating scenic spots of Chongqing city</td>
<td>Make significant policy decision of administrating property and overall direction</td>
<td>Chongqing city</td>
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<td>2</td>
<td>Construction committee of Chongqing city</td>
<td>The provisional regulations of administrating scenic spots of the People’s Republic of China</td>
<td>Take responsible for trades management and routine work of conservation and construction in scenic spots</td>
<td>Chongqing city</td>
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<td>3</td>
<td>Bureau of gardening administration of Chongqing</td>
<td>The regulation of administrating scenic spots of Chongqing city</td>
<td>Take responsible for gardening administration of scenic spots</td>
<td>Chongqing city</td>
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8. Map, Plans, the Boundaries of the Zones
Management Plan of WuLong Karst, Chongqing

Fig.1 Location of WuLong World Natural Heritage Nominated Area in China
Fig. 2 Location of WuLong world Natural Heritage Nominated Area in Chongqing
Fig. 3 Location of the nominated property in Wulong Country.
Fig. 4 Boundary of the nominated property and the proposed buffer zone
Fig. 5 Relationship of Wulong Karst world nominated property and other reserves
Fig. 6 Satellite image of the nominated site of Wulong Karst.
Fig. 7 Geology of Wulong Karst nominated area.
Fig. 8 Boundary of the Furong Cave and the Furong River site
Fig. 9 Boundary of Three Natural Bridges site
Fig.10 Boundary of Houping Tiankeng (giant doline) site