World Heritage Nomination
Natural Heritage: China

FANJINGSHAN

Ministry of Housing and Urban-Rural Development
People's Republic of China

2016

Contents

1. Identification of the Property

1.a Country (and state party if different).....1
1.b State, province or region.....1
1.c Name of property.....1
1.d Geographical coordinates to the nearest second.....1
1.e Maps and plans, showing the boundaries of the nominated property and buffer zone.....1
1.f Area of nominated property (ha.) and proposed buffer zone (ha.).....5

2. Description

2.a Description of property.....6
2.b History and development.....113

3. Justification for Inscription

3.1.a Brief synthesis.....120
3.1.b Criteria under which inscription is proposed (and justification for inscription under these criteria).....122
3.1.c Statement of integrity.....132
3.1.d Protection and management requirements.....142
3.2 Comparative analysis.....143
3.3 Proposed statement of Outstanding Universal Value.....193

4. State of Conservation and Factors Affecting the Property

4.a Present state of conservation.....200
4.b Factors affecting the property.....208
(i) Development pressures.....208
(ii) Environmental pressures.....210
(iii) Natural disasters and risk preparedness.....211
(iv) Responsible visitation at world heritage sites.....213
(v) Number of inhabitants within the property and the buffer zone.....218

5. Protection and Management of the Property

5.a Ownership..... 220
5.b Protective designation..... 220
5.c Means of implementing protective measures..... 227
5.d Existing plans related to municipality and region in which the proposed property is located..... 235
5.e Property management plan or other management system..... 241
5.f Sources and levels of finance..... 248
5.g Sources of expertise and training in conservation and management techniques. 248
5.h Visitor facilities and infrastructure..... 249
5.i Policies and programes related to the presentation and promotion of the property 250
5.j Staffing levels and expertise (professional, technical, maintenance)..... 254

6. Monitoring

6.a Key indicators for measuring state of conservation..... 256
6.b Administrative arrangements for monitoring property..... 259
6.c Results of previous reporting exercises..... 261

7. Documentation

7.a Photographs and audiovisual image inventory and authorization form..... 272
7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property..... 273
7.c Form and date of most recent records or inventory of property..... 276
7.d Address where inventory, records and archives are held..... 277
7.e Bibliography..... 278

8. Contact Information of Responsible Authorities

8.a Preparer..... 306
8.b Official local institution/agency..... 308
8.c Other local institutions..... 309
8.d Official web address..... 310

9. Signature on Behalf of the State Party

9. Signature on Behalf of the State Party..... 312

APPENDIXES:

1 Executive Summary

2 Maps in A0 size

3 Management Plan

4 Atlas

5 Inventory

6 Slides

7 Video Disc

8 Authorization Form

9 Electronic Dossiers

1. Identification of the Property

1.a Country (and state party if different)

1.b State, province or region

1.c Name of property

1.d Geographical coordinates to the nearest second

1.e Maps and plans, showing the boundaries of the nominated property and buffer zone

1.f Area of nominated property (ha.) and proposed buffer zone (ha.)

1. Identification of the Property

1.a Country (and state party if different)

The People's Republic of China

1.b State, province or region

Jiangkou County, Yinjiang Tujia and Miao Autonomous County, Songtao Miao Autonomous County, Tongren City, Guizhou Province

1.c Name of property

Fanjingshan

1.d Geographical coordinates to the nearest second

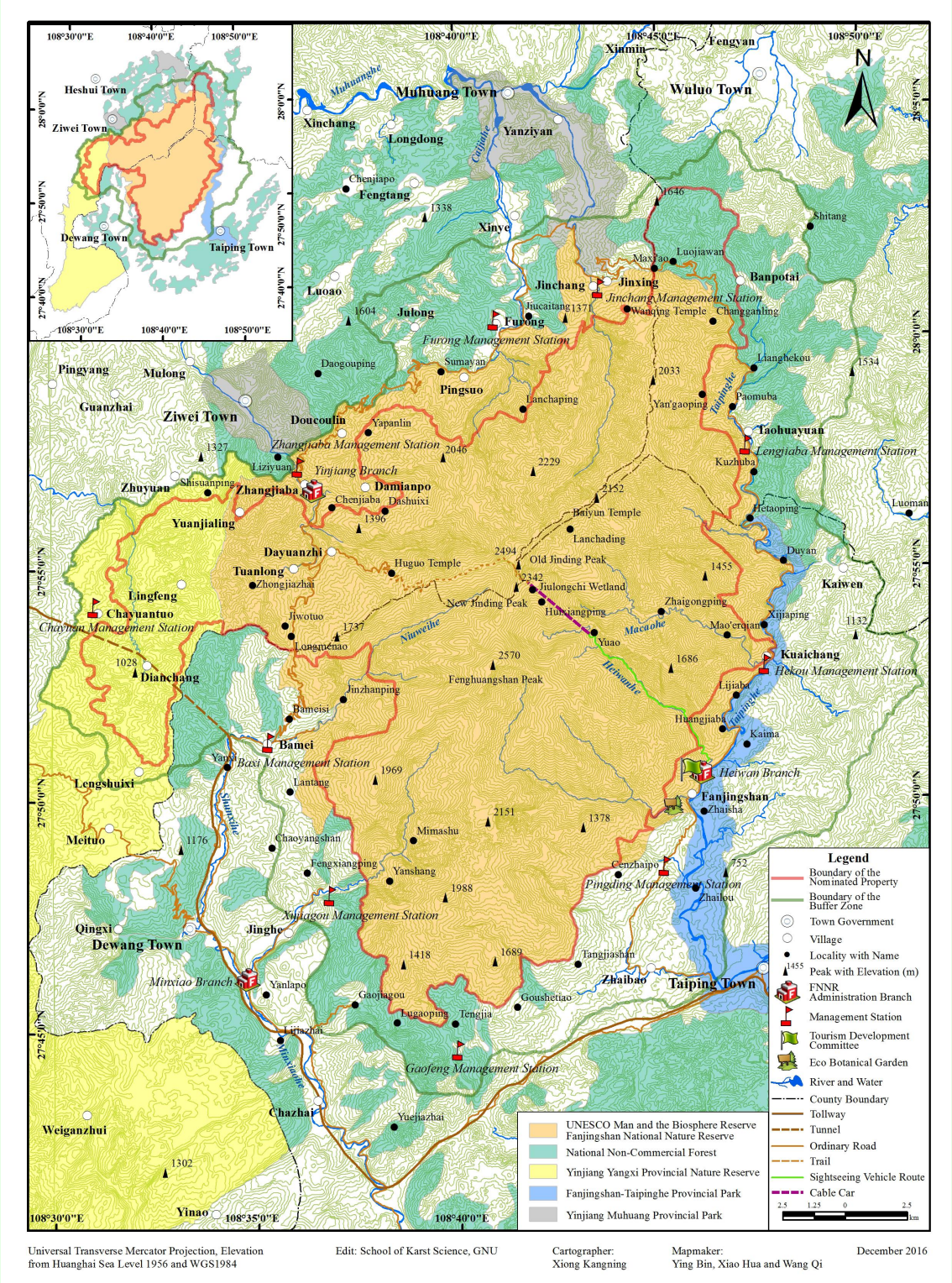
N27°53′44″, E108°40′48″

1.e Maps and plans, showing the boundaries of the nominated property and buffer zone

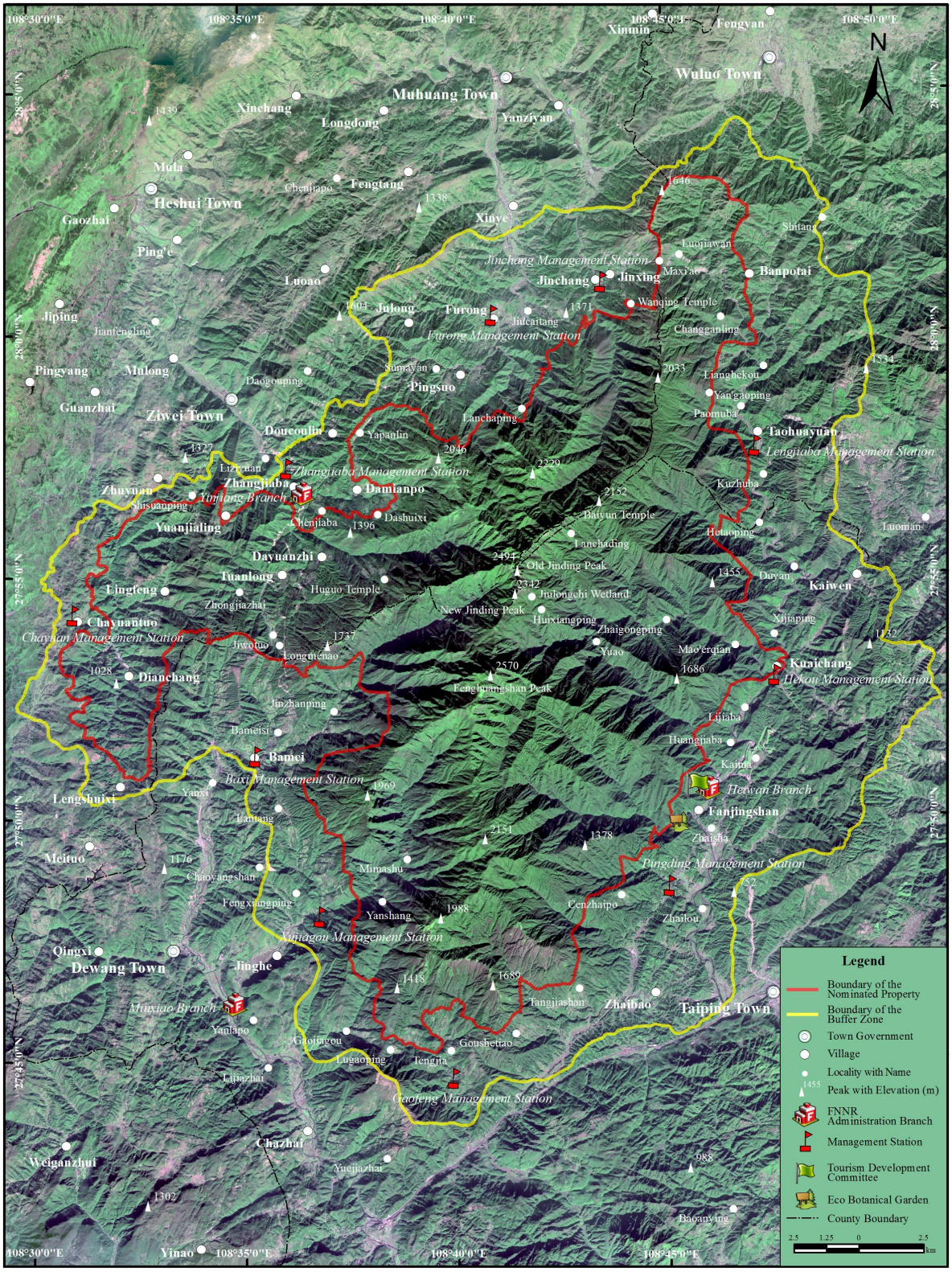
Map 1.1 Location of the nominated property of Fanjingshan in China

Universal Transverse Mercator Projection, Elevation from Huanghai Sea Level 1956 and WGS1984 | Edit: School of Karst Science, GNU | Cartographer: Xiong Kangning | Mapmaker: Ying Bin, Xiao Hua and Wang Qi | December 2016

Map 1.2 Detailed map of the nominated property of Fanjingshan



Map 1.3 Map showing relationship of the nominated property of Fanjingshan to the existing protected areas



Universal Transverse Mercator Projection, Elevation from Huanghai Sea Level 1956 and WGS1984

Edit: School of Karst Science, GNU

Cartographer: Xiong Kangning

Mapmaker: Ying Bin, Xiao Hua and Wang Qi

December 2016

Map 1.4 Satellite image of the nominated property of Fanjingshan

1.f Area of nominated property (ha.) and proposed buffer zone (ha.)

Area of the nominated property __40, 275__ha

Buffer zone __37, 239__ha

Total___77, 514___ha

2. Description

2.a Description of property

2.b History and development

2. Description

2.a Description of property

2.a.1 General features

Fanjingshan Mountain is located in the transitional zone from Yunnan-Guizhou Plateau towards the Western Hunan Hills on the second step of the three gigantic geomorphological steps of China. Fanjingshan is the prominent peak of the Wuling Mountain Range, trending NNE with an oval shape long in north-south axis but narrow in east-west axis. The highest point in Fanjingshan is 2,570 m above the sea level, and the lowest is 500 m. The majority of the property has an elevation difference more than 2,000 m. Fanjingshan is a metamorphic rock faulted dome mountain which is much higher than the surrounding karst landforms and affected by intense erosion with rolling hills, deep valleys and pensile waterfalls (Yang, 1986). It can be regarded as an isolated metamorphic rock “island” is surrounded by a sea of karst. The topography descends discontinuously, with three planation surfaces at 1,800 m, 1,350 m and 850 m respectively. Fanjingshan lies in the East Asian monsoon climate zone, with the characteristics of apparent mid-subtropical monsoons of humid mountainous climate. Fanjingshan is centered arounds several mountain peak: the New Jinding peak, Old Jinding peak and Fenghuangshan peak, and sits astride the watersheds of the Wujiang and Yuanjiang river systems. More than 20 rivers flow down from the top of the mountain radially with many waterfalls and water drops to the bottom. The valleys are deep, densely vegetated and with large gradients. The mountain yellow and dark yellow-brown soils have the widest distribution in scale and together with the altitudinal range play a key role in shaping the vertical forest bands developed that characterize Fanjingshan. Fanjingshan is an outstanding representative of a subtropical humid mountain ecosystem with diverse vegetation types and plentiful faunal and floral communities. The isolated “island” geomorphology environment creates a relatively independent living environment, providing the most favorable conditions for the ancient animal reproduction and plants evolution. The nominated property is still inhabited by many ancient plant and animal species that originated before Quaternary and the Tertiary period more than 70 million to 2 million years ago.

Natural landscape: Fanjingshan has been awarded the title of the best mountain in Guizhou. There are a multitude of magnificent scenes including marvelous peaks and rocks, towering old trees, dense streams cascading through the forest, many rare plants and animals, and the best primary forest retained at comparable latitudes in the world.

The unique geological and climatic environment in Fanjingshan produces equally unique natural landscape features such as rolling mountains, precipitous valleys, extraordinary rock formations, isolated peaks, gorges, water features, biological elements and weathered landscapes, all of which contribute to the property's dramatically diverse landscape characteristics (Photo 2.1). With an elevation range of up to 2,000 m, the nominated property provides different habitats for various azalea (*Rhododendron*) species. When spring comes, different kinds of colorful azaleas blossom over the mountains and valleys, creates a spectacular scene.

Biology and ecology: Unique combinations of temperature and precipitation at different altitudes form distinctive mid-subtropical, north-subtropical, warm temperate, mid-temperate and cold temperate climatic bands. Vegetation altitudinal bands like mountain forest, subalpine shrub, and meadow and so on develop well, including evergreen broad-leaved forest, evergreen deciduous broad-leaved mixed forest, sub alpine coniferous broad-leaved mixed forest and alpine scrub and other vegetation types. The nominated property is an outstanding example of a subtropical humid mountain forest ecosystem with various types of vegetation and abundant plant communities, among which the most typical and representative are *Fagus*, *Davidia involucrata*, *Castanopsis fargesii*, *Tsuga chinensis* and *Cyclobalanopsis argyrotricha* communities. Under these dominate forest canopy species are recorded 2,767 species of animals and 4,394 species of plants, including many rare and endangered plants and animals, such as *Abies fanjingshanensis*, *Davidia involucrata* and *Rhinopithecus brelichi*. The forest of Fanjingshan is essentially in its original state without traces of human activity in most regions. The native ecological environment provides a wonderful habitat for wildlife, and the large vertical elevation difference creates diversified ecological environment, which together provide the ecological environment basis for the rich flora and fauna diversity (The Group for the Scientific Survey of Fanjingshan, 1986).

2.a.2 Physical geography

The nominated property of Fanjingshan is located in the southwest end of Wuling range, and at the junction of Jiangkou, Yinjiang and Songtao Counties in the northeastern Guizhou Province. The geographical coordinates are N27°45′6″-28°3′10″, E108°30′41″-108°47′51″.

Photo 2.1 Fanjingshan

Geological background: Fanjingshan is located in the southwestern margin of the Jiangnan Orogenic Belt; and forms part of a rift basin in the Proterozoic Eon (Wang, 1990; Wang et al., 2012). The formation of Fanjingshan experienced four remarkable geological events and tectonic movements including Fanjing-Wuling, Xuefeng, Yanshan and Himalayan Movements, and it was especially shaped by the tectonic movement and the latter uplifting in the Late Mesozoic period. Its natural landscapes such as the mountain topography and geomorphology, forest ecosystem, soil, climate and water are closely related to the geological environment and basic geological characteristics (He, et al., 1990). The Presinian strata are widely distributed in Fanjingshan region, which is an important window to study the geological tectonic evolution of Precambrian in South China. The Precambrian strata outcropped in the early Paleozoic strata in the form of a “core complex” in the two different structural units: Fanjingshan Group and Banxi Group, which are separated by angular unconformity surface (Dai, 2010; Wang et al., 2012). Banxi Group is mainly distributed in mountain front and the dome structure center like Fenghuangshan, Jinding peaks, Doupengshan Mountain and Niutoushan Mountain with metamorphic conglomerate, palimpsest sandstone and phyllite. Fanjing Group is all distributed in the core parts of the mountain dome, where typical basic and ultrabasic igneous rocks can be seen. The strata sequence of Fanjingshan is the key to understand the early evolution of this sedimentary basin in the Neo-proterozoic era. Fanjing Group is divided into seven rock groups with a total thickness of more than 9,400 m, forming an intact sedimentary record (Gao, et al., 2014). According to isotope geological age data of the oldest stratigraphy (Fanjing Group), its age may be between 1,000 Ma.B.P and 1,400 Ma.B.P and older than the Xiaya Group of Shennongjia, the oldest stratigraphy of Shennongjia in western Hubei Province in China (Deng, 1986). Thus, a complete stratigraphic framework can be demonstrated in Fanjingshan through the low degree of rock strata metamorphism, perfectly preserved primary structure; clear fold structure style exhibited by distribution of stratigraphic units; moderate tectonic transposition in stratum deformation and completely preserved intrusive contact relationships of intrusive rock.

Geomorphological features: The metamorphic rocks in Fanjingshan were formed during Fanjing-Wuling orogeny, approximately 1 billion years ago. From 1,000 Ma (Million years ago) to 227 Ma, the northward oceanic plate suffered from sub-duction northward, transgression and regression on the block alternately, and the carbonate deposits were formed around the rock block. From 227 Ma to 205 Ma, the land in the Fanjingshan area and the karst area around it were formed during the Indo-China orogeny. From 205 Ma to 96 Ma, under the impact of the Yanshan orogeny, the Jinding -

Fenghuangshan and low hills round basin as a band of ladder and the dome shape of blocked mountain were then formed. Until 96 Ma, under the impact of the Himalayan movement, the karst stratum around Fanjingshan were gradually denuded, the metamorphic rocks exposed, a fornix metamorphic rock island and radial rivers gradually formed. Since 2.6 Ma, the Neo-tectonics has made Fanjingshan a non-karst faulted dome mountain which is higher than its surrounding karst areas and it is still experiencing continuing intense erosion. There is an obvious difference between its core and surroundings, as well as the upper and lower mountain. It is the main feature of the nominated property of Fanjingshan in macro perspective (the Group for the Scientific Survey of Fanjingshan, 1986). The main part of Fanjingshan was affected by the weathering conditions and hydrothermal function in the Tertiary period and severe frost weathering in the Quaternary Ice Age (Deng, 1986), when unique erosional-tectonic landform types formed, such as unique canyons, gorge landforms, and paleo-climatic landforms such as novation swales and horn peaks. There are karst landforms and fluvial landforms in the surrounding areas, dolines, shafts, blind valleys, depressions, karst springs and underground rivers, for instance. The geomorphological implications to Neo-tectonics of the nominated property of Fanjingshan is expressed through synchronous ring-layered knick point, the unique landform of canyon-in-gorge, the obviously different longitudinal profile gradients from different elevations, the different terrain ratios which reflect the geomorphological development of the valleys, differences on river terrace between the upper-mountain and lower-mountain, and the metamorphosis planation surface, and so on (Yang, 1986). So Fanjingshan has an important scientific value for the study of neo-tectonics in the non-karst region of southwestern China.

Climate Type: The nominated property of Fanjingshan is located in the East Asian monsoon climate zone. It is obviously affected by monsoon from south-eastern sea in summer, but little by the cold wave in winter. Its mean annual temperature varies from 5.0 to 17.0 ℃ , decreasing markedly with altitude. The decrease of annual average temperatures due to altitude is 0.50-0.56 ℃ /100 m. With obvious vertical climate differentiation, there is an obvious vertical climate belt score according to temperature, wind velocity and cloud quantity which increases with the altitude. The annual precipitation varies from 1,100 to 2,600 mm, the highest rainfall in Guizhou Province and Fanjingshan is one of the wettest regions in China. Its mean annual relative humidity is above 80%. Fanjingshan represents an outstanding example of mid-subtropical monsoon humid mountainous climate in China which is advantageous to the survival, reproduction, growth and development of the animals and plants. Because of the angular

relationship between mountain ridge direction (NE-SW) and monsoon, differences in water and temperature conditions on either side of the mountain are significant, which is reflected by the differentiation on the distribution and composition of vegetation. During appropriate weather conditions, it will appear the spectacular meteorological Buddha's light in Jinding and Lanchading peaks which is same to 'Emei Baoguang' and whose diameter can be 3-5 m. According to the present explanation, this is formed by the diffraction of sunlight when it passes through the little hole among water drops in cloud or mist which is in the opposite direction to the sun (The Group for the Scientific Survey of Fanjingshan, 1986).

Hydrology and Drainage: The nominated property lies in the upper reaches of numerous rivers, and is on the divide between the Wujiang and Yuanjiang river systems both ultimately draining into the Yangtze River (Figure 2.1). With numerous gullies, many surface rivers develop a fine and radiating drainage pattern. Heiwanhe, Panxihe, Waxihe, Macaohe, Huangnigou, Liaojiang, Kaituhe and Niuweihe rivers are in Jiangkou County; Xiaojiahe, Yujiagou, Taojinhe and Yangxihe rivers are in Yinjiang County; Yuquangou and Luanshihe rivers are in Songtao County. Due to the intense retrogressive erosion, the rivers are characterized by steep gradients, plentiful rapid flow, dangerous shoals, rapids and waterfalls. The total length of these perennial rivers is more than 200 km, with a mean annual discharge of 12.37 m^3/s and no break of flow throughout the year. These rivers cut the mountains radially, therefore, the mountains are also in radial distribution with thin ridges, usually knife-like, centered by New Jinding, Old Jinding and Fenghuangshan. Altitude drops sharply from the center to the surroundings. As a result, the mountain was described as a landscape with "Rivers Originating from New Jinding, Ranges Originating from Thousands of Book-liked Rocks" (Yang, 1986).

Soils: The soil distribution patterns in the nominated property mirror the terrain, climatic and biological vertical zonation: mountain yellow red soil, mountain yellow soil, mountain yellow brown soil, mountain dark elfin forest soil and mountain meadow soil appearing from the bottom to the top of the mountain successively (He, et al., 1990). The mountain yellow soils and dark yellow-brown soils have the largest distribution by area, next for mountain yellow red soil, and the mountain dark elfin forest soil and mountain meadow soil have the smallest distributions, which are all forest soils. Residual deposit and slope wash from weathering metamorphic rocks of the Banxi Group of Proterozoic are the main soil parent materials. The source rocks are palimpsest siltstone, palimpsest quartz sandstone, sericite slate, phyllite, palimpsest tuff and metamorphic splits keratophyre. In terms of quality, the organic matter layer of soil is generally thicker and its content is

higher; the content of nitrogen and phosphorous is higher, but the available nutrient content is lower. In terms of the soil mechanical composition, the content of sand and silt grains is higher, but that of clay particles is lower; and the soil erosion resistance is weaker (The Group for the Scientific Survey of Fanjingshan, 1986).

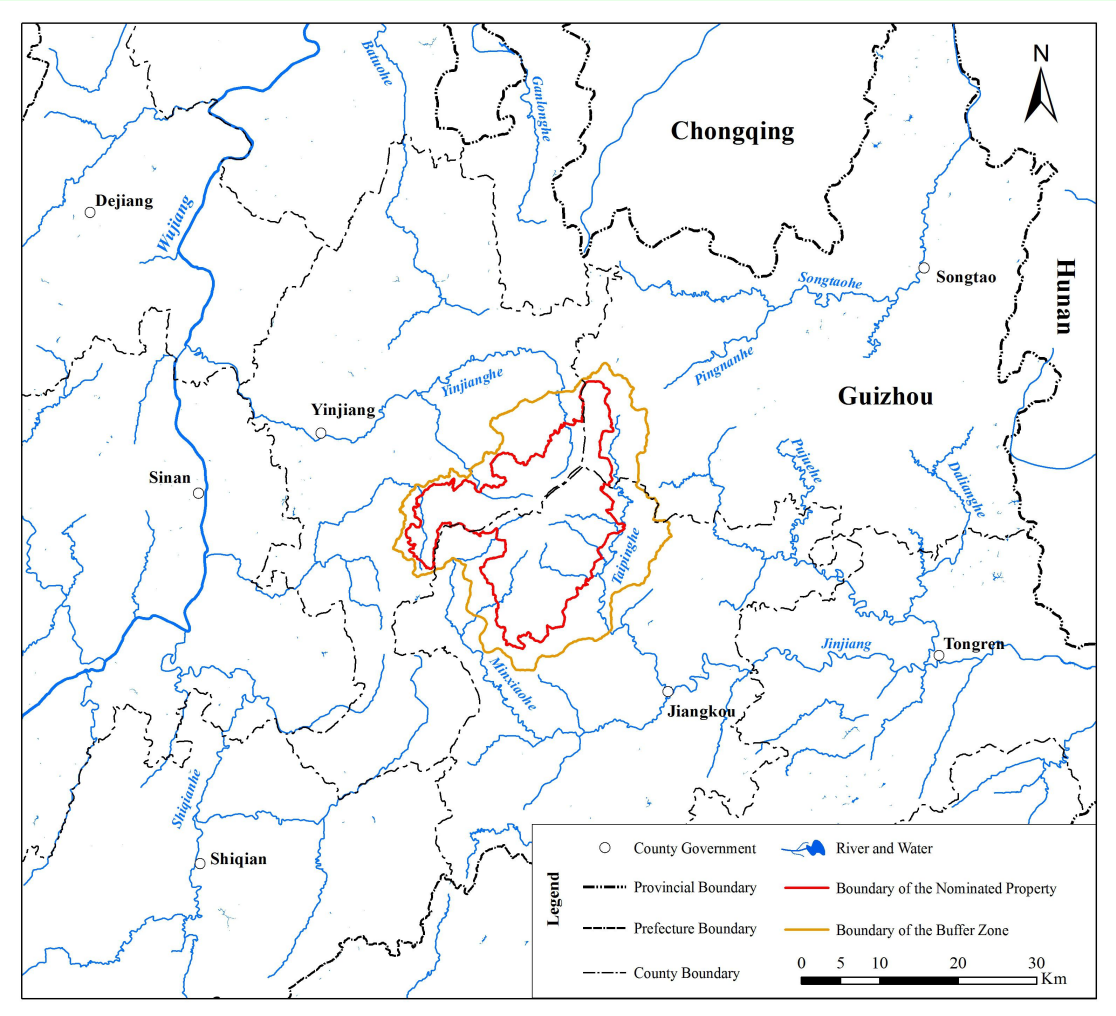


Figure 2.1 Drainage of Fanjingshan

2.a.3 Natural landscape and natural beauty

Successive geological events and processes of erosion have left a landscape of high peaks and deep gorges which are very well developed and beautifully formed in Fanjingshan. The seemingly endless rolling mountains, the peculiar landscapes, dramatic gorges, waterfalls and dazzling flora and fauna create the wonderland of Fanjingshan, which gives us a sense of “Where can we see the vast scenery in one view? Come to the most attractive mountain in Guizhou!”

2.a.3.1 Landscape types

The nominated property presents one of the most beautiful landscapes in China, Asia and indeed the world, with cloud-kissing vault mountains, magnificent and precipitous stone peaks, rocky towers, inspirational mushroom-like stones, primary forests, wild flowing streams, rivers and plunging waterfalls, and mysterious weather phenomena like fantastic clouds, mist and rainbows. Locally Fanjingshan is considered to comprise ten bizarre landscapes: fantastic rock peaks, miraculous trees, heavenly wind, cloud seas, wonderful springs, rare birds, amazing animals, the Buddha's light, the snow-covered landscape, and the famous 8,250 stone staircase.

Gorges and mountain ridges : Mountains in the nominated property rise gradually in the surrounding lowlands but soar steeply in the middle sectors, giving the site a vertical elevation difference over 2,000 m (Photo 2.2). As the main peak of Wuling Mountains, Fanjingshan was the first ancient region to be transformed into dry land by rising from the sea in Guizhou. Fanjingshan is like a huge emerald gemstone set in a crown of white karst hills. The altitude of the highest peak, Fenghuangshan, is 2,570 m and the altitude of the second highest peak, Old Jinding, is 2,494 m; the altitude difference with Panxihe of Dongposhan Foot (altitude: 500 m) is 2,000 m. These mountains resemble the serrated edge of a knife blade, for example Bodao Ridge, Sheshen Cliff and Heixiong Ridge. The slope is usually 30°-35°, and there are many incised rivers and gorges, cliffs and ridges, such as Jindaoxia Gorge, Jiandaoxia Gorge, Dawang Gorge, and many others unnamed. These mountain ridges are sharply a knife-like, such as Bodao Ridge, Sheshen Cliff, Heixiong Ridge (Photo 2.3).

Photo 2.2 Mountain landscape

Photo 2.3 Ridges

Rock landscapes: The rocks outcropping in Fanjingshan are mainly ultrabasic rock which is steep and vertical with less neutral and acid volcanic lava (Photo 2.4-2.7). Other rock types include metamorphic rocks, sandstone and phyllite, are flat and overlapping. The landscapes of the top of the mountain, such as New Jinding, Old Jinding, Rolls of Books Rock, Juchishan Mountain, Taizishi, Shanwan, Jiulongchi Wetland etc., are periglacial landforms, which were impacted by freezing and weathering during the Quaternary period. Under long-term natural processes, the rocks in different positions of the mountain have formed magnificent and unique shapes like stone peaks, pinnacles, mushroom rocks, and rolls of stones.

Photo 2.4-2.5 Horizontal rock stratums

Photo 2.6-2.7 Rock fissures

The peaks: The outcropping metamorphic detrital rocks have developed cliffs, peaks, column landscapes, horizontal rock formations with vertical joint clefts and steep angles of joint surfaces (Photo 2.8-2.9). The representative peaks are sleeping Buddha, Hongyunjinding peaks, Yuejingshan Mountain, Dajianfeng etc. Some of the peak formations are broken and look like broccoli, and some have collapsed, leaving only a lonely peak. Typical of this is New Jinding (Photo 2.10), a 90 m high steep Tor, at the altitude of 2,494 m, a feature which has inspired the saying - “abrupt steepness out of the area with height of more than thousands of feet”; and it is divided by Jindao Gorge. Some peaks resemble stone columns, for example Mogushi (Photo 2.11), and Wanjuanjingshu. The characteristic of Mogushi is a square sandy slate and quartz

sandstone column, 10 m high, named for the upper bigger stone covering the lower smaller one, like a mushroom. Other unusually shaped rock formations include Siguoya, Laoyingyan, Taizishi, Fantianyin, Shenguishi and Tianhuashi etc.

Photo 2.8 Peak cluster on the top

Photo 2.9 The broken peaks landscape, like the broccoli

Photo 2.10 New Jinding peaks

Photo 2.11 Mogushi

Water features: Fanjingshan dome landform generates special river patterns and systems. Firstly, many radial rivers emanate from Jiulongchi wetland at the top of Fanjingshan to the surrounding areas (Photo 2.12). Secondly, nominated property's steep slopes generate many rushing crystal clear rivers and streams, creating cascades, rapids and pensile waterfalls. Thirdly, more than 20 waterfalls are located at three elevation levels, the first is at 1,000-1,100 m, the second 1,400-1,500 m, and the third 1,800-1,900 m (Yang, 1986) (Photo 2.13). The representative waterfalls are Heiwan Waterfall, which is located in the small East Heiwanhe falling into Heiwanhe, Biaoshuiyan Waterfall, which is located in the north Biaoshuiyan River falling into Taojinhe, Tongchanggou Waterfall, which is located in the west Tongchanggou River feeds into the Niuweihe, and the south Guimenguan Waterfall of the south Panxihe (He et al, 1990). Moreover, there are many amazing springs and lakes, such as Jiulongchi wetland, Banruo Spring, Yuanjue Lake, etc. Jiulongchi wetland (Photo 2.14) is located between New Jinding and Fenghuangshan, which were formed by geological collapse.

Photo 2.12 Rapids in Fanjingshan

Photo 2.13 Waterfall

Photo 2.14 Jiulongchi wetland

Weather and landscape phenomena: Fanjingshan displays many amazing weather phenomena which interacts with the landscape, especially clouds, rainbows, mirages and the so-called Buddha's light. Cloud, rainbow, sunlight and Buddha's light changing rapidly and irregularly in the mountains of the nominated property (Photo 2.15-2.17). The clouds always hover at the height between 1,800-2,200 m. Waterfall-like clouds cascade over the mountain ridges and are the consequence of air rising up one flank of the mountain, and going down the other, creating a spectacular phenomenon.

Photo 2.15 Sunrise

Photo 2.16 Waterfall-like clouds

Photo 2.17 Rainbow

Fanjingshan mirage: From spring to summer the air sometimes reflects the mountains, trees, and even people such that they appear to be in the sky. Sometimes these mirages appear when the sun rises or sets in the twilight, and if someone stands at Mogushi, Jiuhuangdong or the Hongyunjinding, they can see a large image, dozens of times as large as a person in the opposite direction of the sunshine, it moves when people move, and it can last for about 30 seconds. The mirage is the result of constant refractions of sunlight through air, created by the lower density and higher temperature in the higher air layer, but the opposite situation in the lower air layer at the special topography when there is wind or the wind is weak.

Buddha's light: When you stand on the ridge of the east-north strike of the mountain in the morning or the evening, a bouquet of sunshine shoots out, and the mist rises at the other side, the sunshine will project the figure into the mist. Back to the sun, you can see a ring of seven-color-light: red, orange, yellow, green, blue, cyan, purple and your shadow will be in the middle of the ring. This is the rare "Buddha's light" phenomenon. When the mist rises to a suitable height, the sunshine or moonshine will project the shadow of the viewer onto the mist(Photo 2.18-2.19).

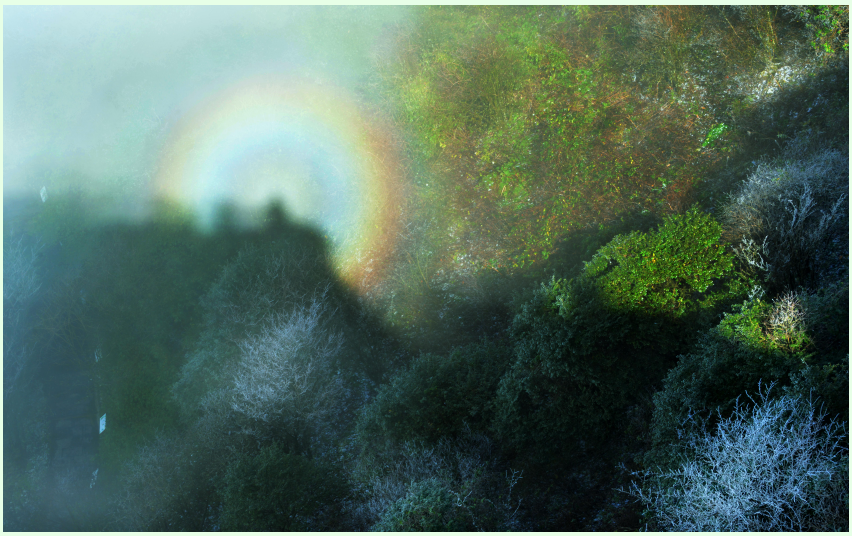
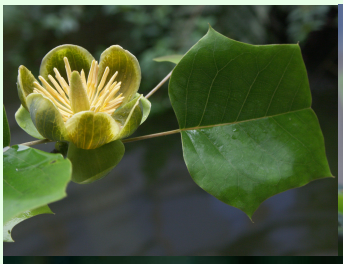
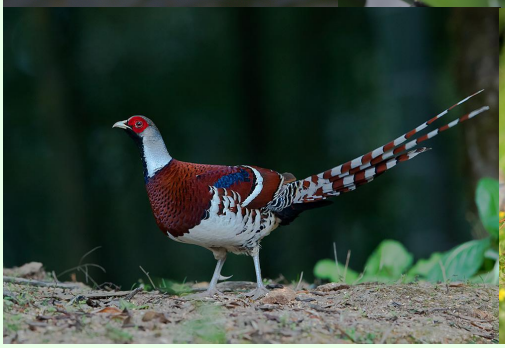


Photo 2.18-2.19 Buddha's light

2.a.3.2 Biotic beauty of Fanjingshan

Flora and fauna: The nominated property is the sanctuary and paradise for many flora and fauna which provides a great range of pleasing biotic landscapes (Photo 2.20-2.30). Beautiful butterflies flirt through the forest or gather beside pools; vibrant pheasants dazzle with their bright plumage or extraordinary long tails; even the occasional frog or snake is marvelous in form. Especially admired are the many ornamental plants, such as Rhododendron, Chinese dove tree, Chinese little-leaf box (*Buxus*), *Abies* firs, hemlock *Tsuga*, *Juniperus squamata* etc. More than 30 species of Rhododendrons occur at different altitudes, and create a glorious sea of flowers from spring to summer. There are 11 areas that feature the endangered Chinese dove trees, the largest area of 200 mu in Xiaoheiwanhe River. These are named due to the fact that their delicate white fluttering bracts look like doves when they are flowering. Stately endemic fir trees with contrasting blue cones *Abies fanjingshanensis* are located at Lanchading and the tallest is up to 22 m. Chinese little leafbox are more than 400 years old, 4-5 m tall, the tallest of which is 7 m. They are located in 1,900-2,300 m at Fenghuangshan. The forest floor is often decorated with pretty orchids.





5.18 14:29

Photo 2.20-2.30 Sanctuaries and paradise for many animals and plants

2.a.3.2-1 Natural beauty of the vertical changes

The landscapes of Fanjingshan vary from the bottom to the top of the mountain. These vertical vegetation bands are consisted of different forests and plant types and each has a distinctive characteristic. There are many valleys shaded by the forests in the lower regions, countless mountain ridges under the forests and the top of mountains. There are particular stone peaks, which allow superb views of the spectacular landscapes (Photo 2.31-2.33).

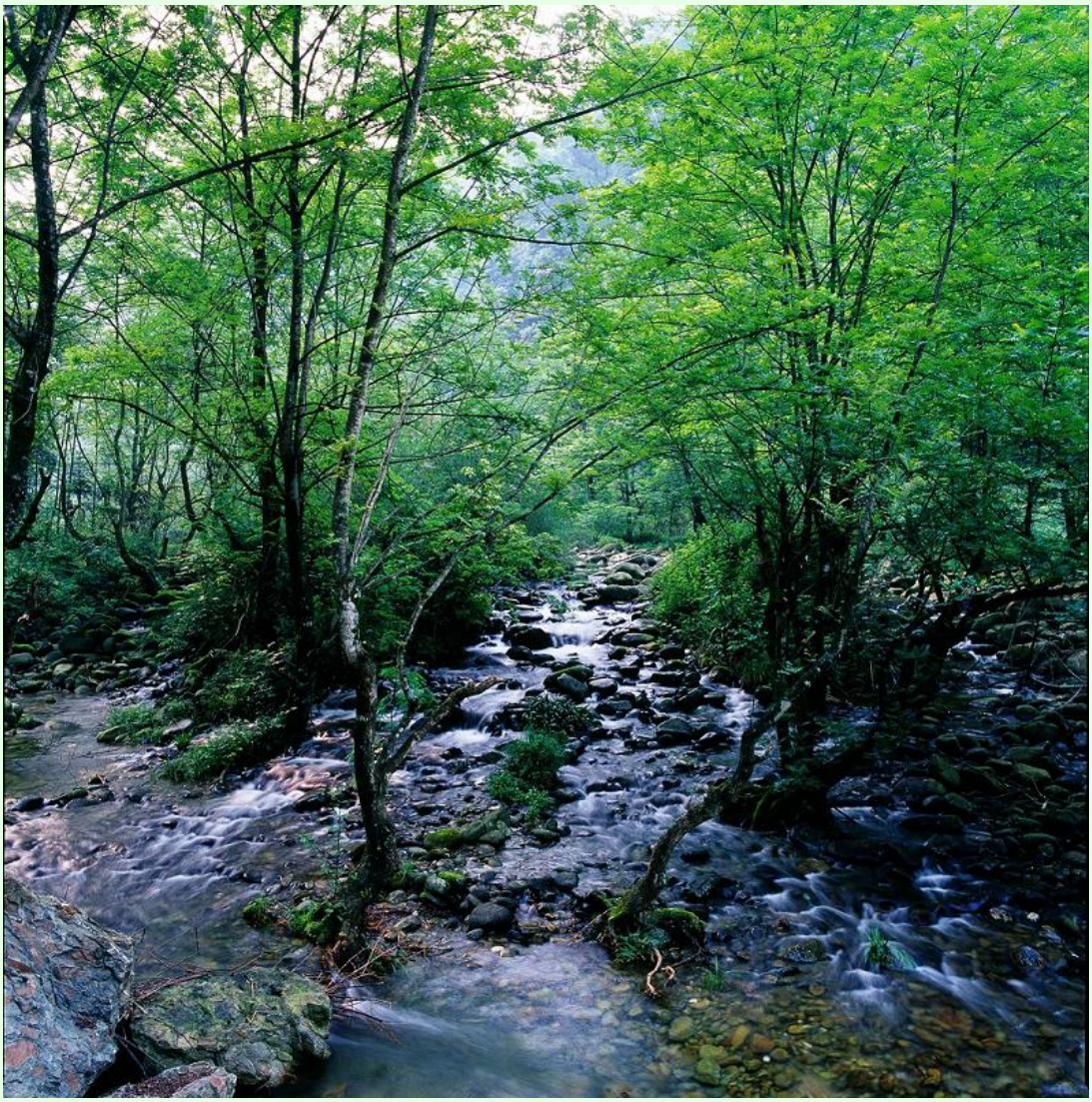


Photo 2.31-2.33 The varying vertical landscapes of Fanjingshan

2.a.3.2-2 Natural beauty of the seasonal changes

The nominated property belongs to the subtropical monsoon climate zone, where rain and high temperature appear in the same period. The hottest months are July and August with an average temperature of 26℃ while the coldest ones are January and February with an average temperature of 5℃, which makes dramatically changes that the forest appearance is dependent in the season. Flowers of all sorts bloom in a riot of form and colour in spring (Photo 2.34), and the mountain has luxuriant vegetation growth in summer (Photo 2.35). It is stunning in the autumnal shades of fall (Photo 2.36) and snow-covered landscapes in winter provide delicate glints of ice and frozen plants (Photo 2.37-2.38).

Photo 2.34 Spring landscape with flowering azaleas

Photo 2.35 Summer landscape

Photo 2.36 Late autumn landscape

Photo 2.37-2.38 Winter landscape

2.a.3.2-3 Constantly changing nature

The dynamic interplay between weather and landscape is a key aspect of the natural beauty of Fanjingshan. Instantaneous weather changes are common in the nominated property especially when there are more clouds in spring and summer. Sometimes the clouds darken the sky, just seconds later, they vanish at the top of the mountains; or the clouds just appear at one side of the mountain ridge, while the sun shines on the other side. Due to erosion in particular corrosion at the top of the mountain, the rocks have developed quite irregular shapes, creating strange peaks. Many of these peaks vary in vegetation coverage, and when the clouds flutter through, it looks particularly magical (Photo 2.39-2.41).

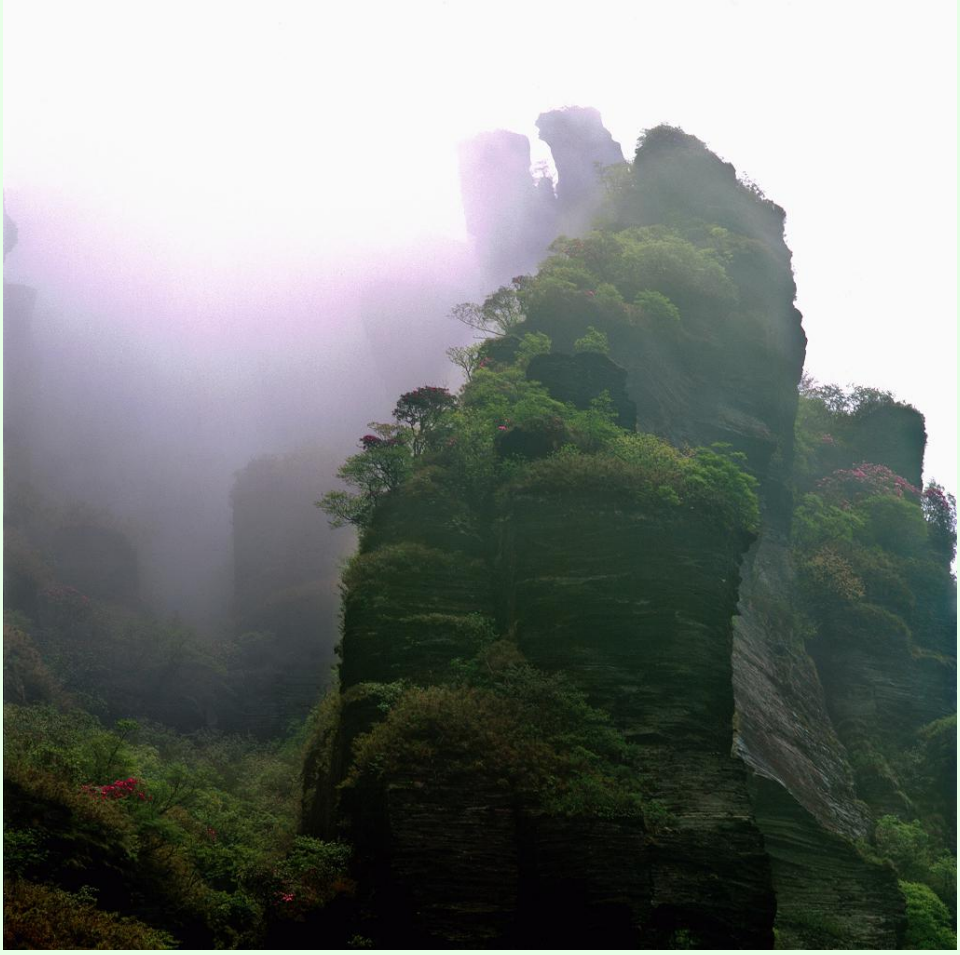


Photo 2.39-2.41 The miracle of Fanjingshan

2.a.3.3 Aesthetic importance

(1) Natural beauty of the main landscape and symbolic landscape

With its vault mountain, gorges, knife-blade ridges and isolated peaks, the nominated property of Fanjingshan has an intact mountain forest ecological system. It is filled with physical, biological and meteorological landscapes that are unique and perfect aesthetic character and high aesthetic importance.

(2) Experts' views on the aesthetic importance

Aesthetically, Fanjingshan can be said to have integrated many of the qualities attributed to other famous mountains in China: "The Wonder of Mount Huangshan", "The Elegance of Mount Emei", "The Steepness of Mount Huashan" and "The Magnificence of Mount Taishan". "It is as precipitous as the Five Mountains (Wuyue), and its magnificence can be maintained for thousands of years." Therefore, Fanjingshan is called "The family of the famous mountains in China". In the territory, peaks soar high into the sky, brooks babble and waterfalls flow down vigorously. Under the erosion of wind and rain for

billions of years, high mountains, stone forests and peak groups near the Old Jinding are carved, such as “Mogushi”, “Eagle Rock”, “Rolls of Books Stones”, and “General’s Head”. These scenes are extremely inspiring, vivid and interesting. In New Jinding, the isolated peak soars high into the sky. New Jinding was split into two parts by Jindao Gorge, which is a steep peak and people can climb it only with iron chains. A flying bridge is used to connect the gorge tops, and it is quite precipitous. By standing at the peak, you can see mist and clouds, and everything at a glance; sometimes, it was surrounded by clouds and Buddha’s lights. Therefore, it changes irregularly and mysteriously. Fanjingshan has been widely praised for its natural beauty by many poets, geologists, ecologists, and geo-morphologists.

The towering of Fanjingshan is just like from the haven, around with chaotic peaks and vivid green as Penglai.Time and time again we asked the graceful gas and the different bells, memoried externally with mild wind to the paradise.—Xu Yan, a poet of the Qing Dynasty (1657-1723).

The beautiful Fanjingshan! Overlapping range upon range of hills, skyscraper highest peaks! Nine rivers coming from Jinding, eight mountain ridges converging upon Wanjuanshu! After a rain, rising rivers, waterfalls, and a rainbow arching across the sky; Presently the sun emerged, the fiery red of sunset shining, the clouds fluttering among the mountains, mirage and Buddha’s light appearing! It is the masterpiece of nature. —Fenglin Deng (1920-1988), a geologist, (Scientific survey of Fanjingshan Nature Reserve, 1986)

Either Guizhou or China should feel grateful to have such a beautiful place as Fanjingshan. It is as precious as the jewel on the crown. Its landscape characteristics meet criterion (vii): a region containing superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.—Williams P.W., a geo-morphologist, professor in the University of Auckland (in the symposium of the investigation of Fanjingshan 2014)

The world-famous expert on biodiversity protection , Dr. John MacKinnon marveled at the beauty of Eagle Rock in Fanjingshan and left a poem named "The Eagle" for it: *The eagle stands proudly through rain and snow. Wings shelter her eggs, she never flies. But my heart soars at the wild beauty. Rain gathers in streams and flow in all directions to sustain the land. I watch the rainwater gather in the ravine stream, go to the different directions, and moisten everything.” — Dr. John MacKinnon,* an ecologist, (in the meeting of the World Heritage committee of the experts, the Ministry of Housing and Urban – Rural Development of the People’s Republic of China, Fanjingshan, 2015)

Fanjingshan's geology and geomorphological landscapes are very typical, which is quite valuable for the earth science. The ecological environment is pretty good, there is no more sites beyond comparison with its vegetation and ecology. And with the profound cultural ground, we can say Fanjingshan is a "land of treasure". — Jiaqi Liu, a geologist, the academician of the Chinese Academy of Sciences (in the meeting of the World Heritage committee of the experts, Fanjingshan, 2015)

Fanjingshan has very good ecological and physical environment with the thick forest, and it is a sparsely-populated region of the surroundings, which means less destruction of human activities, and Fanjingshan has particular landform, and high aesthetic and scientific value. — Jianghai Li, a geologist, professor of Pecking University (in the meeting of the World Heritage committee of the experts, Fanjingshan, 2015)

2.a.4 Ecological and biological processes

2.a.4.1 Ecological island phenomenon

The geological origins of Fanjingshan as an ecological "island" are detailed in section 2.a.2 above. Figure 2.2-2.3 below illustrates the origins of the metamorphic island in a sea of karst which dates from the late Triassic Period.

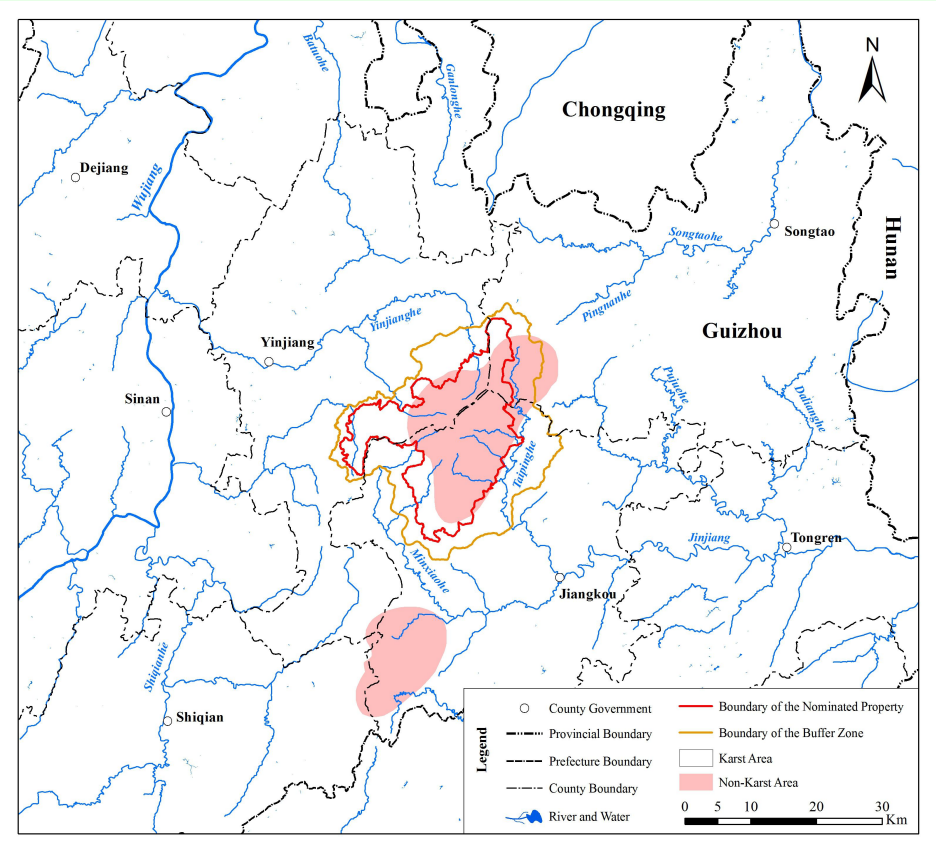


Figure 2.2 The non-karst island of Fanjingshan

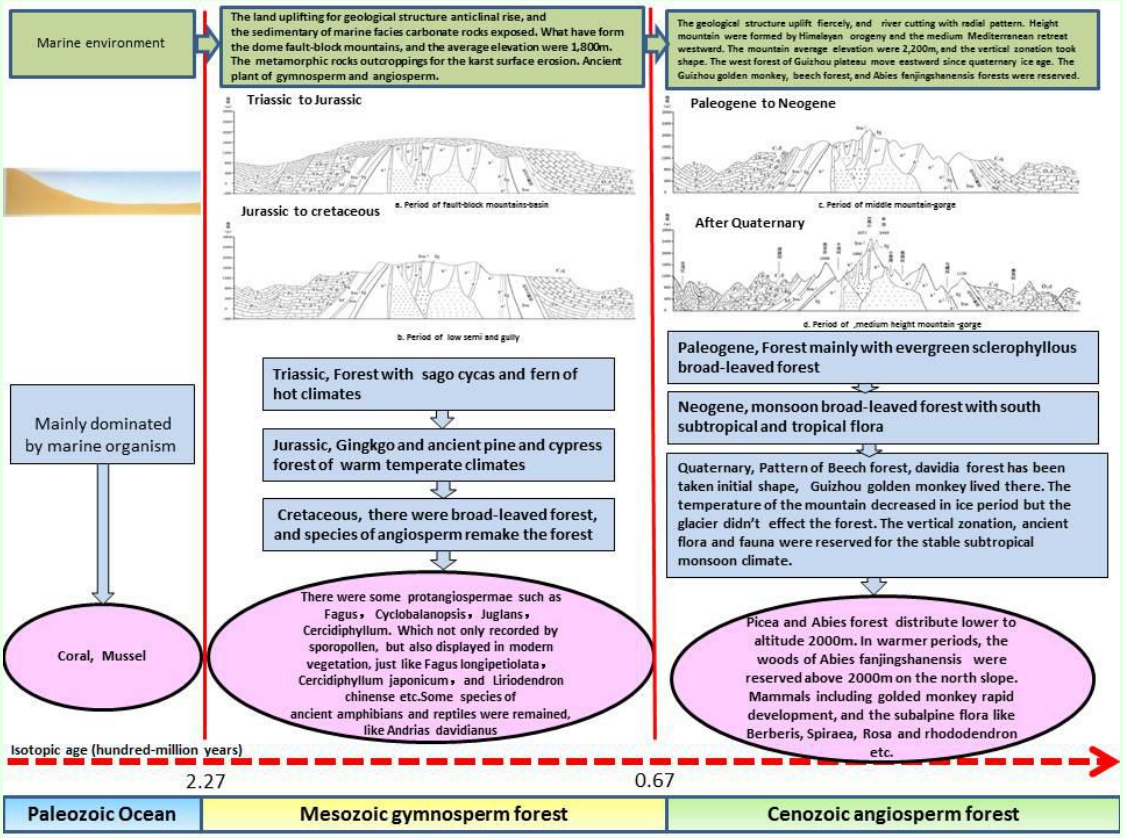


Figure 2.3 Evaluation for forest ecosystem of the island effect in Fanjingshan

The nominated property displays ecological process within mountain forests in the transition region from south subtropical zone to north subtropical region. Biological diversity and local unique species have developed, and many ancient relict plants are preserved. Fanjingshan has preserved the sole populations of globally endangered *Abies fanjingshanensis* and *Rhinopithecus brelichi* populations which require urgent high-level scientific research and protection. Additionally, it includes a sizable, good condition *Fagus* forest with the richest subtropical species mix, important to understand the global evolution and distribution of this important genus from evergreen to deciduous forests. A typical and characteristic evergreen and deciduous broad-leaved mixed forest setting, *Fagus* forest is the constructive species in the subtropical zone. In addition, balanced development is realized between evergreen and deciduous broad-leaved mixed forest and zonal evergreen and deciduous broad-leaved mixed forest. It also contains transition forests linking the karst forests to the non-karst forests. On top of that, an important habitat is provided for rare and endangered animals and plants including *Bretschneidera sinensis*, *Campanumoea javanica*, *Neofelis nebulosa*, *Ursus thibetanus*, *Capricornis milneedwardsii*, *Moschus berezovskii* and *Andrias davidianus*.

2.a.4.1-1 Landscape ecological characteristics of ecological island phenomenon

According to the theory of landscape ecology, Forman and Godron (1986) tried to associate species diversity of landscape patch (S) and architectural features of patch with other factors, i.e. *S=f* (habitat diversity, interference, area, age, base heterogeneity, isolation level, and boundary characteristics). In this sense, Fanjingshan has the following characteristics:

Habitat diversity: Under the combined action of special geological conditions, complicated evolution history, warm and moist climate, and high massif, Fanjingshan has formed diversified habitat types. Fanjingshan possesses 6 level-1 habitat types of IUCN/SSC. The major habitats include forest, bush fallow, grassland, wetland, bare rock region and cave. A diverse continental ecosystem is formed, including various forest ecosystems of 9 types covering evergreen broad-leaved forest ecosystem (Photo 2.42), coniferous forest ecosystem, secondary deciduous broad-leaved forest ecosystem, coniferous and broad-leaved mixed forest ecosystem, evergreen and deciduous broad-leaved mixed forest ecosystem (Photo 2.43), moss coppice ecosystem, shrub ecosystem, *Abies fanjingshanensis* and *Tsuga chinensis* and broad-leaved mixed forest ecosystem and bamboo forest ecosystem. In addition, wetland ecosystems including streams, rivers and swamps, alpine meadow ecosystem, and bare rock ecosystem are also common. Elevation difference of the massif is huge and landforms are diversified. Therefore, this mountainous region involves diverse climate types and extremely rich microhabitats.

Photo 2.42 Evergreen broad-leaved forest ecosystem

Photo 2.43 Evergreen and deciduous broad-leaved mixed forest ecosystem

Interference: Interference is an accidental and unpredictable event in the system, a phenomenon that happens at different spatial and temporal scales, and an event that can obviously change the landscape structure, function and dynamic change process. Depending on the source, interference can be divided into man-made interference and natural interference. In the aspect of man-made interference, because Fanjingshan is high in elevation, steep and has deep gorges, most regions will not be affected by man-made interference. It might undergo very light man-made interference in a few areas (path, peak, river, and boundary farmland), such as impact from construction for paths and temples in Fanjingshan, fishing in the river, deforestation, farming and building of cable cars. Natural interference in Fanjingshan mainly covers the change of landforms in some regions caused by geological disasters like flood or landslide due to heavy rainfall and the change of forest appearance and ecosystem balance caused by seasonal plant diseases and insect pests; erosion to bare rock regions; possible forest fire. However, in general, man-made and natural interference in this region is light, and fires almost unheard of, so the massif has maintained the original features of forest ecosystem well.

Area: The area of the nominated property is 40,275 ha. According to the area effect in the theory of island biogeography, area of an island is closely related to the attribute of biological diversity. This region has a relatively large area of evergreen broad-leaved

forest, evergreen and deciduous broad-leaved mixed forest, and subalpine dark coniferous forest. The population of *Rhinopithecus brelichi* (global rare and endangered species) living here for a long period of time is maximally 750, and it serves as the flagship species in this region. Concerning complete habitat, the population quantity of key species are able to survive and the area needed by it should be determined according to population density of the key species, requirements for habitat diversity, requirements in inheritance, and biological characteristics of the species. For Fanjingshan, key species include *Fagus lucida* beech forest community and the *Rhinopithecus brelichi* population. The minimum viable population (MVP) should be worked out, and then minimum survival space of the species can be determined. In the 1980s, Franklin put forward the “magic numbers” (50 and 500), representing short-term and long-term estimates of minimal viable population sizes. For animals, the long-term surviving effective population is still suggested to be 500. The N_e of suggested long-term plant survival proposed by botanists is 1,000-4,000. Thereby, the population quantity of *Rhinopithecus brelichi* is about 700, exceeding the minimum viable population value calculated for the long-term survival for the species. The inhabitable area (the most suitable, sub-suitable and comparatively suitable) for *Rhinopithecus brelichi* in the nominated area is 38,518 ha. According to field observation results on population density of *Rhinopithecus brelichi* in Yangaoping, the population is stable, showing that the area suitable for survival in Fanjingshan can support the survival of this flagship species. From the angle of key plant species, the quantities of *Fagus* and *Abies fanjingshanensis* in this region far outdistance the value of N_e. Therefore, area of the nominated property can be expected to maintain adequate habitats for the key species.

Age: The number of species on the island depends on the island area, age, habitat diversity, possibility and richness of colonizers entering the island, and balance in colonizing speed of new species with local extinction rates. After experiencing Fanjing–Wuling, Xuefeng and Yanshan Movements, Fanjingshan has formed the basic framework of dome old land. According to the distribution of *Liriodendron chinense* which is the earliest existing relict plant of the Tertiary Period, terrestrial life of this region began to develop in this period. During the Himalayan Orogeny of the Tertiary Period, multiple small landforms or microhabitats were formed successively in the nominated property, creating favorable conditions for the propagation and differentiation of ancient terrestrial higher-plants. On the mid and late stages of the Pleistocene Period, some animals like *Rhinopithecus brelichi*, *Campanumoea javanica*, *Ursus thibetanus*, *Viverra zibetha*, *Capricornis milneedwardsii* and *Sus scrofa* settled here and still live in this area. The current stable and diversified habitats and microhabitats including evergreen

broad-leaved forest, evergreen deciduous broad-leaved forest, subalpine shrubby meadow and escarpment, have provided an important guarantee for differentiation of new species.

Base heterogeneity: The matrix scope is extensive and has a high degree of connectivity. Moreover, the landscape elements playing a dominant role in landscape function are background territories in the landscape. From the matrix angle of the ecosystem, Fanjingshan towers extensively above the peripheral karst matrix. From the perspective of ecosystem type, the peripheral region of Fanjingshan is mainly a farmland mosaic, so the basal heterogeneity is not strong. According to matrix analysis, heterogeneity of the peripheral matrix in Fanjingshan is low, and contrasts with the richer matrix of Fanjingshan property. This demonstrates the isolation of Fanjingshan.

Isolation level: The similarity between the ecosystem of the surrounding region and ecosystems of the nominated property should also be considered. If the nominated property is surrounded by similar ecosystems, the isolation level will be relatively low. However, the nominated property of Fanjingshan is a domal massif dominated by metamorphic rocks, and zonal forest ecosystems with mountainous features developed on it, while ecosystems developed on the surrounding karst area are mainly farmland or bush fallow. Hence the isolation level of this nominated property is enhanced. According to the comparison of plant species between the nominated property of Fanjingshan and surrounding karst environment, sharing of species is only 28.83% which is comparatively low and indicates the high degree of isolation. Only 16 surrounding karst plants have entered the ecosystem of Fanjingshan, and all of them are distributed in the evergreen broad-leaved forest belt of the peripheral lowland mountains.

Boundary characteristics: As a significant attribute of patches, boundary can be used to indicate space location relationship and ecological interface characteristics of different component types on both sides of the boundary. It has many description parameters like length, type and quantity, and can sensitively react to the overall pattern evolution of landscape. In general, the forest ecosystem in Fanjingshan is well preserved. Especially since the initial protection stage of the 1980s, different ecosystem types in Fanjingshan have remained stable, and the area of vegetation coverage in the buffer has recovered to some extent. However, man-made interference activities still exist in some places, and some edges of the ecosystem show degradation. Generally speaking, the massif of Fanjingshan has an integral structure and the forest ecosystem is dominated by broad-leaved forest distributed in linked pieces. The landscape presents almost no fragmentation, and the boundary quantity is stable.

In conclusion, according to the verification of Forman and Godron for island ecosystems from the viewpoint of landscape ecology, rich species diversity in the island patch of Fanjingshan is closely related to characteristics like diverse habitats of the patch, low degree of interference, the ability of the area which is not large to support the survival of key species due to the primitive ecosystem, old age, low base heterogeneity, high isolation level, and stable boundary quantity (Figure 2.4-2.5). One of the reasons why the site has been able to preserve its high diversity through the climatic oscillations of the Ice Ages is that the site is very humid and also very steep. This means that species have the capacity to make only very small horizontal adjustment in range to accommodate large rises and falls of climate temperature, by simply moving further up or down the mountain sides.

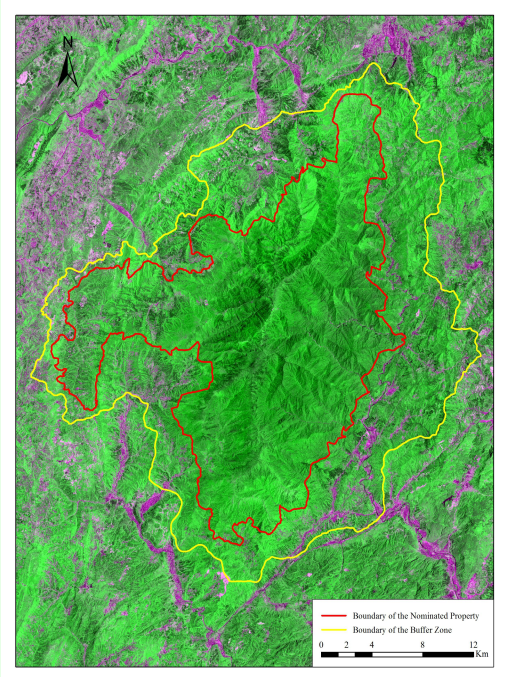


Figure 2.4 Remote-sensing image of the nominated property in 2010

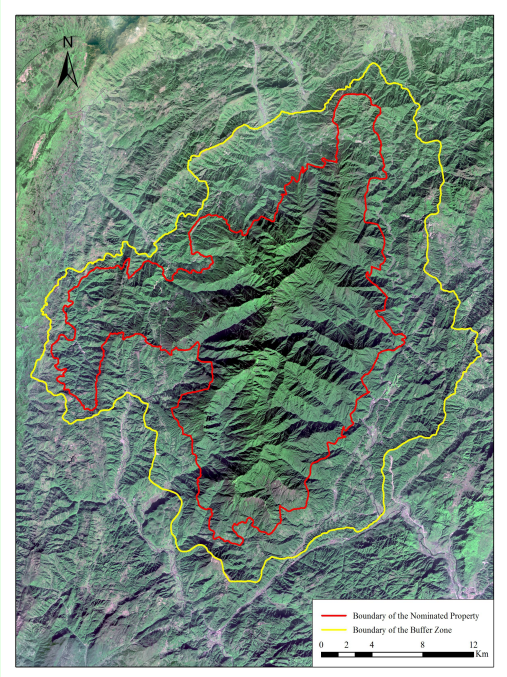


Figure 2.5 Remote-sensing image of the nominated property in 2015

2.a.4.1-2 Floristic effect of ecological island

The nominated property has 3,724 species of higher plants, while the surrounding karst region has 1,559 higher plants. The similarity of higher plants between these two areas is 24.83%, and the similarities of bryophyte, fern and spermatophyte are 20.04%, 29.07% and 25.81% respectively, so the similarity degree is quite low (Table 2.1).

Karst plants distributed in the nominated property include 32 species such as *Carpinus pubescens*, *Nandina domestica* and *Pistacia chinensis*, occupying 1.23% of the total quantity of spermatophytes. Most of them are distributed in the evergreen broad-leaved forest belt of low mountains, and 16 of them are also included in the surrounding karst

sectors to the west of the property. The nominated property flora differs markedly from the surrounding karst plants. In the peripheral region of the nominated property, cross distribution phenomenon of karst plants and non-karst plants is presented. The ecological island effect on plantlife is obvious.

Table 2.1 Comparison of species similarity between the nominated property and surrounding karst region

Region	Sperma-tophyte	Similar Species of Spermatophyte	Fern	Similar Species of Fern	Bryo-phyte	Similar Species of Bryophyte	Higher Plants	Similar Species of Higher Plant
Fanjingshan	2,584	758	349	107	791	186	3,724	1,051
Surrounding karst region	1,110		126		323		1,559	

2.a.4.2 Original records of the mountain ecosystem

2.a.4.2-1 Pollen records and vegetation succession

The Quaternary sporo-pollen samples from areas of Jiulongchi wetland, Lanchading, Huixiangping etc. (Chen, 1990) record the change of Holocene vegetation and climate in the nominated property. Changes are revealed that the transitions from evergreen deciduous broad-leaved mixed forest with evergreen trees to evergreen deciduous broad-leaved mixed forest with deciduous trees to deciduous broad-leaved forest to coniferous broad-leaved mixed forest are dominated by pine and oak; no vegetation to sparse vegetation to deciduous, evergreen broad-leaved forest or perhaps no vegetation to deciduous, evergreen broad-leaved forest dominated by deciduous broad-leaved trees. The responsible climate changes are interpreted as follows: very warm and humid–warm and humid to warm–warm cool–warm moist, and cool–warm cool–warm or perhaps warm cool–warm (Table 2.2).

Sporo-pollen analysis of the Quaternary Period has recorded ancient plants of 30 genera of 28 families, of which plants of 29 genera of 25 families are similar to the existing plants at sample plots including Jiulongchi, Lanchading, Huixiangping in the nominated property. The result of sporo-pollen analysis shows that there were many kinds of broad-leaved tree in the Atlantic period of the Holocene (Zhou, 1990). The above conclusions indicate that the plants in Fanjingshan have strong original nature. However, as the mountain continued to rise, it led to temperature decreasing, which was the main reason of habitat loss of Cyatheaceae, Vittariaceae, Sinopteridaceae, Nymphoides etc. that were distributed in the tropical and subtropical zone.

Table 2.2 Paleo-vegetation and paleo-environment in pollen records in the nominated property of Fanjingshan

Location Name	Soil Layer(cm)	Sporo-pollen Assemblage	Vegetation Process	The Corresponding Climate	The Corresponding Geological Period
Jiulongchi wetland (2,213 m)	80-100	*Cyclobalanopsis-Quercus*	Evergreen, deciduous broad-leaved mixed forest	Warm humid	The Atlantic period
	50-80	*Quercus-Cyclobalanopsis-Betula*	Evergreen, deciduous broad-leaved mixed forest	Warm humid to warm	
	30-50	*Quercus- Salix-Polypodiaceae-Athyriaceae*	Deciduous broad-leaved forest	Warm dry	
	20-30	Cyperaceae-*Pinus-Quercus*	Coniferous and broad-leaved mixed forest	Warm humid	
Lanchading (2,200 m)	50-60	*Quercus*, *Asteraceae, Sinopteridaceae, Pteridaceae, Athyriaceae*	Sparse vegetation	Warm cool	Since the mid-Holocene
	5-50	*Quercus- Salix-Betula-* Poaceae	Deciduous, evergreen broad-leaved forest	Warm	
Huixiangping (1,776 m)	Below 50	None	Maybe no vegetation	Maybe warm cool	
	40-50	*Quercus, Cyclobalanopsis, Salix, Juglans* etc.	Deciduous, evergreen broad-leaved forest	Warm	

Forest dynamics: Approximately in the low-middle part of the mountains below 1,300 m, the climate is humid and hot, and the if the landform is disturbed by natural forces (such as collapsing, landslide and debris flowing), herbaceous plants, deciduous and coniferous tree species (such as *Alniphyllum fortunei, Liquidambar formosana* and *Pinus massoniana*) will settle down, forming a forest after a few years up to more than ten years, but it could take decades to hundreds of years to form a stable community; however, in the middle-upper part of the mountain above 1,300 m, the climate is cool moist or cold moist, and the vegetation restoration is much slower as it is affected by natural forces (Photo 2.44-2.45).

Photo 2.44 Early stage of vegetation succession after landslide on lower part of the mountain

Photo 2.45 Early stage of vegetation succession after landslide on upper part of the mountain

2.a.4.2-2 Ancient animals and plants retained

At the end of Silurian Period of the Paleozoic Era, the nominated property was in the sea at the edge of Ghiangnania ancient land (Huang, *et al*., 1988); from the Permian to Early Triassic of Mesozoic, the nominated property had gone through so much transgression and regression that vegetation of earlier periods was flooded by seawater; from the end of Triassic to Quaternary of Cenozoic, the strong geological movement and climate change affected the distribution, migration, rise, turnover of vegetation and formation and evolution of new species constantly. Coupled with less human activities, the pattern where ancient relict plants are preserved, such as *Cyclobalanopsis*, *Quercus*, *Betula*, and new species are enriched and develop constantly (Figure 2.6).

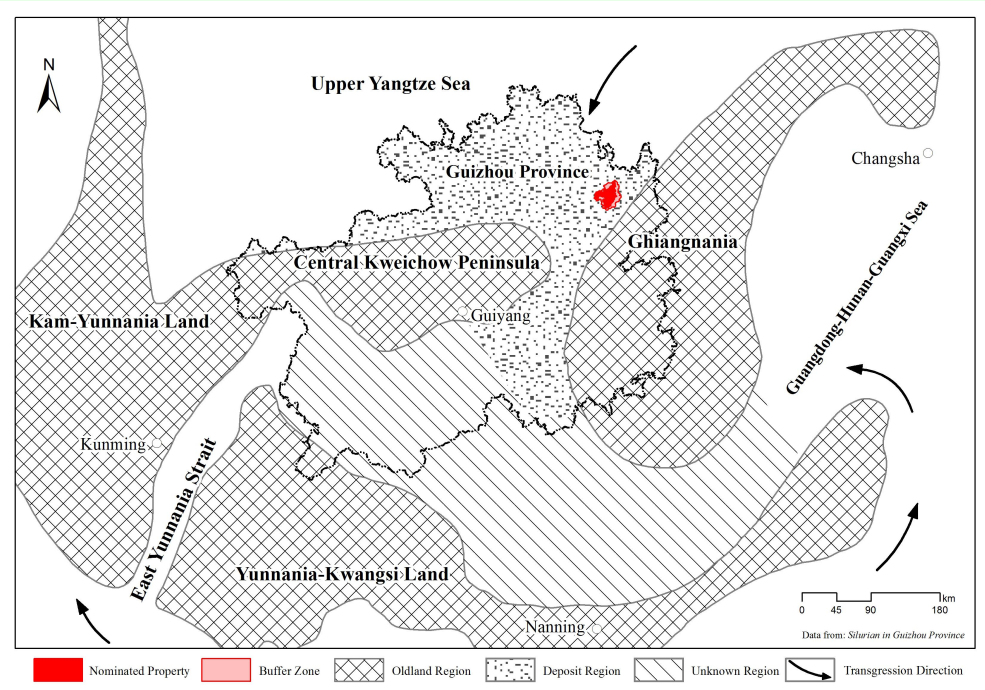


Figure 2.6 Land-sea distribution of Southwest China in the Silurian Period (Huang, et al., 1988)

In the Tertiary Period, the plate of the nominated property was squeezed to move north, and the floristic compositions of southern tropical and ancient south continent entered here, enriching the plant components, such as *Broussonetia*, *Distylium*, *Erythroxylum*, *Symplocos* and *Balsaminaceae* etc. (Huang, *et al*., 1988) (Photo 2.46-2.47).

Photo 2.46 *Symplocos*

Photo 2.47 *Impatiens*

From the Holocene, the latest sporopollen of Lanchading have been recorded. In the property, at that time, the vegetation was deciduous broad-leaved forest or coniferous and broad-leaved mixed forest without *Abies fanjingshanensis*. Due to the descending temperature during the Quaternary, *Abies fanjingshanensis* gradually moved to the lower subalpine areas, replacing parts of the deciduous broad-leaved forest or coniferous and broad-leaved mixed forest in Lanchading during the glacial age (Photo 2.48).

During the Holocene, the vegetation recorded by pollen in Jiulongchi wetland and Lanchading was coniferous and broad-leaved mixed forest and deciduous evergreen broad-leaved forest, similar to the current vegetation types at the altitude of 1,300-1,900 m. However, subalpine dark coniferous forest, deciduous broad-leaved forest and subalpine shrub are distributed about 2,200 m above sea level now, indicating that corresponding evolution and assemblage of vegetation occurred with the terrain uplifting and climate changing, known as “The thermometer of the stratigraphic age” (Photo 2.49).

According to the ancient plant distributions, *Abies* was probably distributed early in the northern hemisphere mid-latitude area. From the point of phytogeography, *Abies* is closely related with the Pacific Rim. A substantial increase in the plateau during the late period resulted in the emergence of the subalpine dark coniferous forest and the property becomes an important center of modern differentiation of *Abies*.

Photo 2.48 Coniferous and broad-leaved mixed forest (1,900 m)

Photo 2.49 Subalpine bush (2,200 m)

Historically, the snub-nosed monkeys used to be distributed more widely in Southern China (Wen, 2003). Fossils of *Rhinopithecus brelichi* were discovered in the Quaternary Period's stratum in Tongzi County, Guizhou Province (Guizhou Fanjingshan scientific survey of the Editorial Committee, 1986). Some experts in Animal Research Institute of Chinese Academy of Sciences revealed the process of differentiation of the Snub-nosed monkeys from the point of view of genetics and considered the Northern species (*Rhinopithecus roxellana*, *Rhinopithecus brelichi*) and Himalaya species (*Rhinopithecus bieti*, *Rhinopithecus strykeri*) started to differentiate 1.6 million years ago. The northern species came into being 620,000 years ago (Zhou, 2014). From geological history, Fanjingshan had undergone four significant tectonic movements, including Fanjing-Wuling, Xuefeng, Yanshan and Himalaya Movements, forming the characteristics of huge mountains and significant terrain uplift (Yang, 2002). The large mountain can provide a shelter for *Rhinopithecus brelichi*. Meanwhile, Fanjingshan is located in the subtropical zone with plenty of precipitation and rich vegetation, so it can provide an abundant food source for *Rhinopithecus brelichi.* Moreover, local residents influenced by Buddhism and local culture and the protection from government ensure that *Rhinopithecus brelichi* can survive and thrive in Fanjingshan.

2.a.4.3 New studies of vegetation response to climate change

2.a.4.3-1 Holocene vegetation response to climate change

From August to October in 2015, we did pollen analysis from samples of peat cores in Jiulongchi wetland of Fanjingshan. The Quaternary spore pollen recorded the change of Holocene vegetation and climate in the nominated property. Changes are revealed from meadow and broad and deciduous leaved forest-evergreen deciduous broad-leaved mixed forest-deciduous broad-leaved forest and meadow. The responsible climate changes are interpreted as follows: warm cool and dry-warm and moist-warm cool and dry.

The characteristics of the ecological environment in early, middle and late Holocene were completely recorded in Fanjingshan, and the climate optimum period of Holocene was in the middle Holocene. Among them, *Fagus* pollens were relatively high during this period in a steady state, although the content of *Tsuga chinensis* pollens were low, while the pollens always existed in this period, moreover, *Abies* pollens were found before 9,000 years.

In the early Holocene (9,516 a BP-9,903 a BP) period, the herbaceous pollens were higher, and the content of the broad - leaved deciduous pollens were relatively high, in addition, the content of pine *Pinus* pollens and fern pollen were also higher, while the proportion of broad - leaved evergreen pollen was less. Climate change was not that stable, and the main climate was cool and dry.

In the middle Holocene (3,852 a BP-9,516 a BP), the content of evergreen broad leaved component pollens began to occupy the absolutely dominant position, while the content of herbaceous pollens decreased dramatically. The content of deciduous broad-leaved and coniferous pollens also reduced slightly, the content of fern pollens was reduced significantly. The climate was warm and humid with much precipitation. This period belongs to the optimum Holocene climate.

In the late Holocene (248 a BP-3,852 a BP), the content of herbaceous pollens increased gradually, and the content of evergreen broad - leaved pollens decreased significantly, meanwhile, the total content of deciduous broad - leaved decreased, and the species and genus composition also changed obviously and the pine pollens and fern pollens increased significantly. The climate changed to warm and cool dry with less precipitation.

2.a.4.3-2 Holocene pollen records in Fanjingshan vegetation changes in accordance with altitude

Fanjingshan was mainly dominated by evergreen deciduous broad-leaved forest in the Holocene period, meanwhile, there was a small amount of coniferous forest, and there were grasslands and meadows in the local environment sometime. Therefore, the evolution reflected Fanjingshan vegetation characteristics under the subtropical climate very well, and that is the ecological eco-tone vegetation of evergreen deciduous broad-leaved forest and subalpine coniferous and broad-leaved mixed forest. The response of vegetation to climate was obvious in such ecological eco-tone zones: when the climate became warmer and more humid, low altitude vegetation and evergreen components increased, and the vertical vegetation zone moved upward, reaching a maximum in the middle Holocene period. When the climate became relatively cold and

dry, high altitude vegetation expanded downward, and the deciduous leaved composition increased, at the same time, the grassland or meadow began to develop in the local environment, while the vertical vegetation zone moved downward. Therefore, the effects of climate change are well demonstrated in Fanjingshan.

2.a.4.3-3 Eco-response to climate change and reproductive isolation

The reproductive isolation made by the rugged mountainous area obstructed the hereditary exchange, which promoted specification and differentiation. At the same time, Fanjingshan was influenced by the uplift of Qinghai-Tibetan Plateau and the Quaternary Ice Age, which caused fluctuation of the climate and showed more temperate character and species differentiation.

We analyze the relict gymnosperm species as an example by floral differentiation (Feng, 2010). The flora differentiation of gymnosperm families reaches to 2.85. The genus flora differentiation of some important families, such as Cephalotaxaceae and Pinaceae, were over 2. On the one hand, uplift of formation can result in the climate change by the effect of high mountains, especially since the temperature at the top of the mountain was getting cool promoting gymnosperm species differentiation. On the other hand, geographical isolation caused by the complex terrain may have resulted in new species differentiation. It was hard to make hereditary exchange for the background of significant difference of geology and geomorphology. Some biological groups responded in floral differentiation and specialization, and formed new species and new groups. There was not only an abundance of gymnosperm species, but some evolution can be seen in species such as *Primula fanjingensis, Chirita obtusidentata, Cirsium fanjingshanense, Impatiens fanjingshanica* and so on in Primulaceae, Gesneriaceae and Asteraceae also developed well.

2.a.4.3-4 Flora intersection and transitional prominence

High mountains, complex terrain and diverse climate make Fanjingshan a unique place with a wealth of plant species and complex biota. The nominated property is located in the south of “Wulingshan Corridor”, where its plant flora diffuses from tropical zone to the temperate zone, and it is influenced by the southeast monsoon from Pacific Ocean and southwest monsoon from Indian Ocean and belongs to subtropical monsoon mountain climate (Figure 2.7). Fluctuating temperature and humidity have offered key conditions for the intersection of plants of different flora. Because of the intersection of different elements, Fanjingshan’s flora is complex, and Fanjingshan is the vital transition zone from south to north and from west to east.

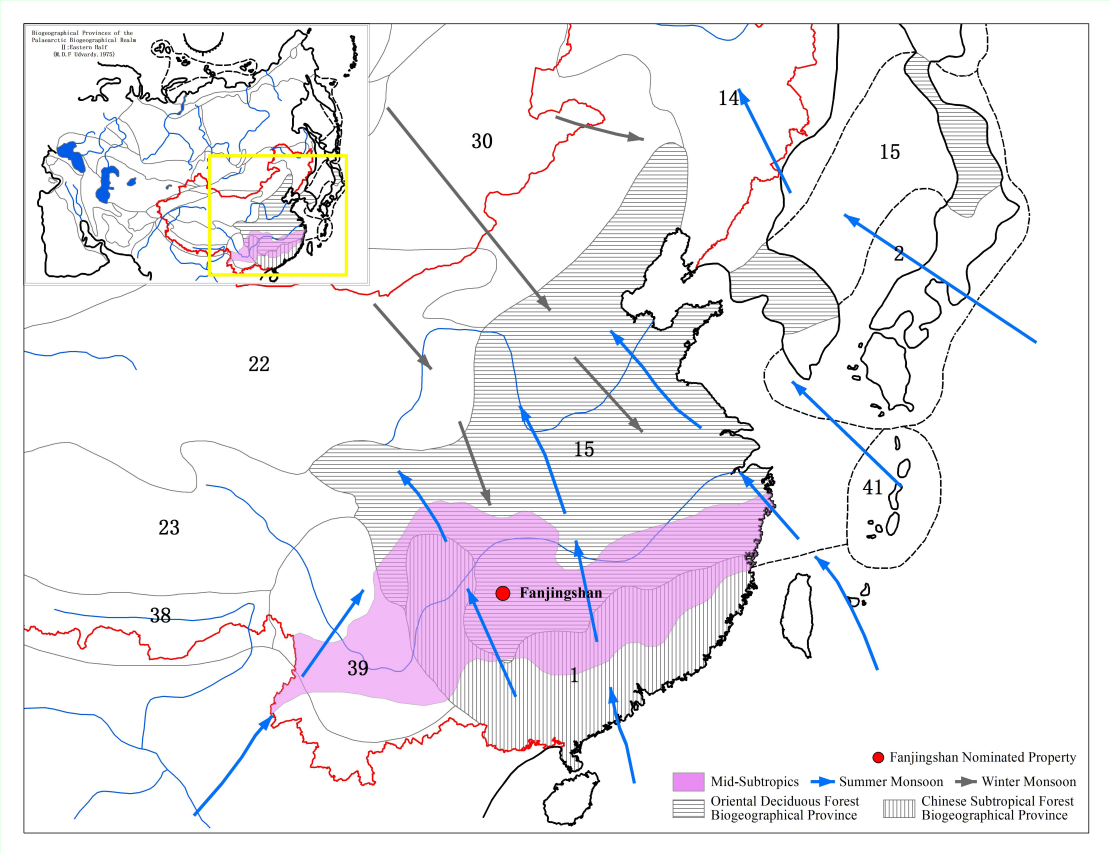


Figure 2.7 Geographic position in Mid-Asia of the nominated property, the relationship with the Biogeographic Province and its climate influences

Due to its special conditions, Fanjingshan is the boundary point of the distribution of many plants. According to the list of Spermatophytes of Fanjingshan and Atlas of Woody Plants in China (Fang et al., 2009), there are 120 class 197 genera 288 species (Table 2.3) that treat Fanjingshan as a distribution boundary.

Table 2.3 Quantitative statistics of floristic intersection of Spermatophytes in Fanjingshan

Boundary Category	Class		Genus		Species	
	Quantity	Percentage/%	Quantity	Percentage/%	Quantity	Percentage/%
North	41	34.17	74	37.24	103	35.76
South	25	20.83	39	19.90	62	21.53
East	31	25.83	54	27.55	87	30.21
West	23	19.17	30	15.31	36	12.5
Total	120	100	197	100	288	100

The number of the plant species which treat Fanjingshan as its north boundary (such as *Machilus ichangensis* and *Distylium chungii*) is more than the plant species that treat Fanjingshan as its southern limit (such as *Schisandra chinensis* and *Rosa banksiopsis*); the plant species that treat Fanjingshan as its east boundary (such as *Cerasus serrula* and *Cyclobalanopsis gambleana*) are more abundant than the plant species that treat Fanjingshan as a western boundary (such as *Yulania amoena, Illicium ternstroemioides*)

(Figure 2.8). So Fanjingshan is the barrier that prevented many tropical and subtropical plants moving further north and also stopped many west Himalaya components moving eastward.

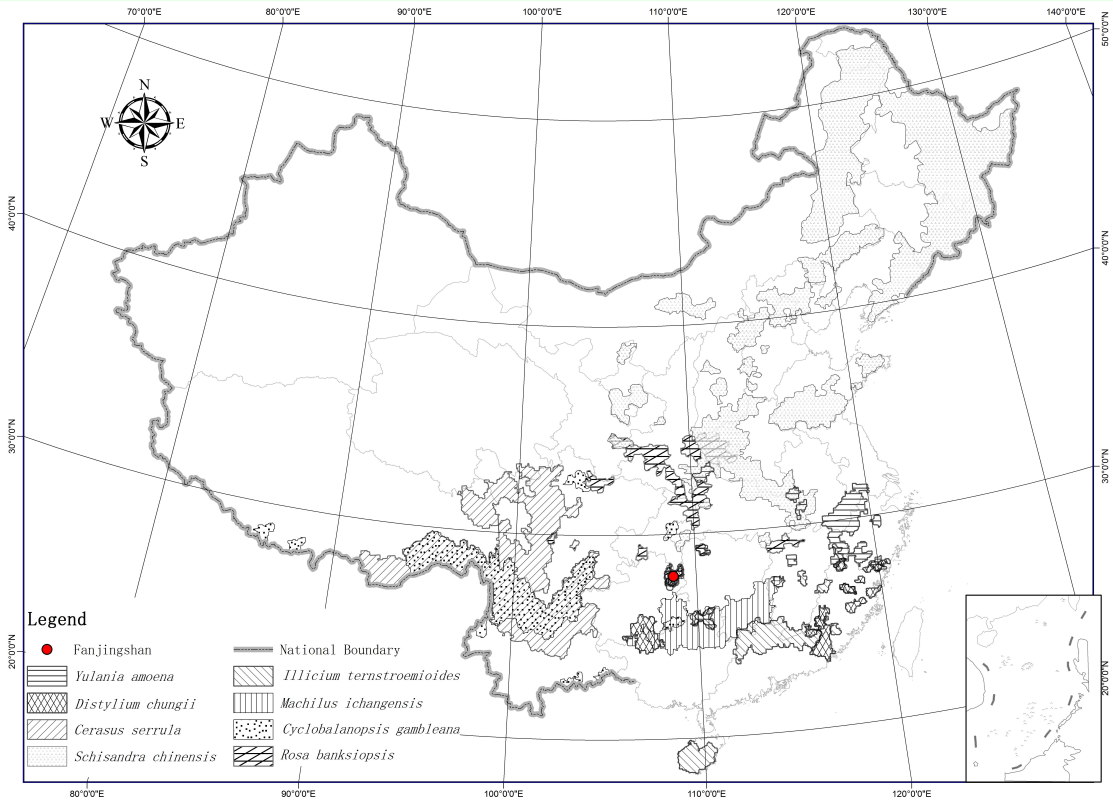


Figure 2.8 Distribution of typical floristic intersection of spermatophytes in Fanjingshan

From analysis of growth types of genera of floristic intersection of spermatophytes, a typical feature that Fanjingshan acted as a demarcation limit is obvious (Table 2.4). Among genera of spermatophyte which Fanjingshan acts as the northern limit, trees are absolutely dominant, especially evergreen trees, the taxa are dominated by evergreen trees; among genera of spermatophyte which Fanjingshan is the eastern limit, trees are dominant, especially deciduous trees, the taxa are dominated by deciduous trees.

Table 2.4 Growth types of genera of floristic intersection of Spermatophytes in Fanjingshan

Growth Types		North	South	East	West	Total	Percentage/%
Tree	Evergreen	27	8	15	7	57	28.93
	Deciduous	14	10	12	6	42	21.32
Shrub		23	17	18	11	69	35.03
Vine		8	3	6	5	22	11.17
Bamboo		1	3	2	1	7	3.55
Total		73	41	30	53	197	100

Fanjingshan is not only a limit boundary for a great number of plants, but also a critical bridge of diffused plants of East Asian for their transfer in east-west direction. According to the study on the diffused pattern of plants of East Asian (Wang, 1992), the southwest China probably is an important development center which has formed during the northwards moving of angiosperms (Chen, 2001), and Fanjingshan, on the edge of southwest China, has developed many diffused patterns from west to east and from southwest to northeast (Table 2.5).

Table 2.5 Quantitative statistics of diffused Spermatophytes of East Asian in Fanjingshan

Pattern		The total number of plants	The number of plants in Fanjingshan
Pattern Ⅰ in west-east direction	Ⅰ$_1$ From SW China to E China	132	94
	Ⅰ$_2$ From SW China to Taiwan	33	25
	Ⅰ$_3$ From SW China to Japan or/ and adjacent regions	88	67
	Ⅰ$_4$ From the Himalayas to C China	47	7
	Ⅰ$_5$ From the Himalayas to E China	17	8
	Ⅰ$_6$ From the Himalayas to Taiwan	19	10
	Ⅰ$_7$ From the Himalayas to Japan or/ and adjacent regions	23	16
	Total	359	227
Pattern Ⅱ in southwest-northeast direction	Ⅱ$_1$ From SW China to S Shanxi or S Hebei	18	1
	Ⅱ$_2$ From SW China to the Yinshan Range or/ and adjacent regions	40	1
	Ⅱ$_3$ From SW China to Jilin or Heilongjiang	7	0
	Ⅱ$_4$ From SW China to Siberia or/ and adjacent regions	43	6
	Ⅱ$_5$ From the Himalayas to S Shanxi	1	0
	Ⅱ$_6$ From the Himalayas to the Yinshan Range or/ and adjacent regions	7	1
	Ⅱ$_7$ From the Himalayas to Jilin or Heilongjiang	2	0
	Ⅱ$_8$ From the Himalayas to Siberia or/ and adjacent regions	6	1
	Total	124	10
Total		483	237

Fanjingshan is a vital corridor and important bridge of the diffused plants of East Asian for their transfer in west-east direction. The number of diffused plants of East Asian in Fanjingshan accounts for half of the total, and the number of diffused plants of pattern Ⅰ in Fanjingshan account for 63.23% of pattern Ⅰ. Fanjingshan's plants are related closely to the plants and flora of I_1, I_2, I_3 and I_7.

Fanjingshan is not only the key barrier and boundary of intersection of plants, but also the critical corridor and bridge of the diffused plants of East Asia for their transfer in west-east direction, meanwhile, it offers an important site for intersecting, co-existing and competing of evergreen and deciduous trees. Among the 288 species plants which treat Fanjingshan as its typical boundary, the species that treat Fanjingshan as their north boundary and east boundary are more than other directions and evergreen species and deciduous species are developing together which means that Fanjingshan as a barrier has prevented many tropical, subtropical and Himalayan plants moving further east. The plants which treat Fanjingshan as its north boundary are dominated by evergreen trees; the plants which treat Fanjingshan as its east boundary are dominated by deciduous trees. The plants of East Asian distribution in Fanjingshan showed distribution direction pattern of west to east migration obviously, and it is closely linked with the plant flora of its east and west sides.

Tropical plants dominate the bulk of the flora with north and south transition properties in Fanjingshan. When the east and west interaction is considered in Fanjingshan, the quantity of evergreen plants is almost equal to and just about 7.59% more than the deciduous plants. These results are inconsistent with the geographical fact that Fanjingshan is located in the middle Mid-subtropical zone. Furthermore, Fanjingshan is located in the south Oriental Deciduous Forest biogeographic province and adjacent to the Chinese Subtropical Forest biogeographic province (Udvardy, 1975).

The reasons are as follows: the climate of Fanjingshan is controlled and influenced by southwest monsoon in late spring, by the southeast monsoon in midsummer and by the cold current of Siberia high pressure zone from the first month of autumn to the first month of winter. The site is located in the north of the quasi stationary front of Yunnan-Kweichow Plateau in winter, and is close to the frontal surface of the quasi stationary front in spring and autumn, so the climate conflicts are notable and frequent. In addition, the climate together with the height above sea level leads to the formation of evergreen broad-leaved forest and evergreen and deciduous broad-leaved mixed forest. Therefore, under the influences of special landform and isolated-island climate, Fanjingshan, lying in the south Oriental Deciduous Forest biogeographic province, is an outstanding example of the floral overlap and mixing.

2.a.4.4 The ecological process of human and harmonious

2.a.4.4-1 Life of ethnic groups and ecological process

The site is the representative case of homogeneous development, evolution and balanced development between evergreen broad-leaved forest and evergreen and deciduous broad-leaved mixed forest in mountains of Mid-subtropical zone and fascinating instance of the vegetation of Oriental Deciduous Forest biogeographic province. The facts highlight an extremely important phenomenon of island biogeography but also indicate the high resilience of Fanjingshan flora and give high hope of its future survival in the face of new anthropogenic climate change which the site managers will continue to monitor closely.

There are several ethnic minority groups living around Fanjingshan such as Tujia, Miao, Dong, Buyi, Gelao and so on. These indigenous peoples have traditionally pursued environmentally sustainable practices through their spiritual, cultural, aesthetic, material production and daily lifestyles. They exhibit a deep respect for nature and a profound understanding and appreciation for the wealth that nature provides.

Ethnic minorities live in Fanjingshan, planting crops, producing food, vegetables and tea by their own fields, and with food, rice bran and vegetables feed pigs, this traditional mode of production has been maintained for thousands of years. Ethnic minorities gather together generally, the materials for building house, Wing and Rain Bridge and drum-tower are wood construction, and the wood is from their own woodlot. Their activities conform to the regulation of natural ecosystems when they pursue the interest, arduous and simple labor cultivation, filled with the quiet and peaceful of the real life.

Furthermore, the protection of natural resources by ethnic minorities has been central to the life and belief systems of Miao, Buyi, Tujia and Dong. All share the custom of protecting and not cutting or burning forests on the mountain.

2.a.4.4-2 Religious beliefs and ecological process

Buddhism has a vital effect in Fanjingshan and its ideas and the monks' lifestyle reflects that the central tenants of respect for nature and the maintenance of ecological harmony. The Maitreya faith also promotes coexistence with nature, and provides a model for green ecological practices which preserve ecosystem and ecological processes.

Buddhism was introduced into Guizhou late in the 7th century. In the 12th century, temples had been built in the surrounding areas, and from then on, Buddhism began to affect Fanjingshan. By the 17th and 18th century, Buddhism reached its golden age and formed a pattern of Five Royal Temples and Forty-eight Ordinary Temples (Wang, 2001) (Table 2.6).

Table 2.6 Buddhist relic properties in Fanjingshan

Temple	Location	Level	Properties
Cheng'en Temple	Taiping Village, Jiangkou County	Imperial	Shangcha Temple Monument; Fanjingshan Forbidden Cutting Forest Monument
Tianqing Temple	Muhuang Town, Yinjiang County	Imperial	Patio; 4 Stone Tomb Towers; 5 wooden houses; Tripitaka House ruins
Huguo Temple	Yongyi Village, Yinjiang County	Imperial	Fanjingshan Brief History Monument
Zhongling Temple	Yongyi Village, Yinjiang County	Ordinary	Stone walls; Stone statues; Residual monument
Dongde Temple	Yongyi Village, Yinjiang County	Ordinary	Merit monuments
Xingsi Temple	Muhuang Town, Yinjiang County	Ordinary	Wooden houses
Baiyunsi Temple	Muhuang Town, Yinjiang County	Ordinary	Stone house; Main temple ruins

Imperial Fanjingshan Golden Summited Reconstruction Monument was located in Dishui Rock in the northern Golden Summit in the year of 1,618, which was a significant historical relict of Fanjingshan Buddhism. It not only described the beautiful environment but also recorded the Maitreya faith which was once popular in this area and promoted a harmonious world where humans are kind to other creatures with no killing and no eating meat.

Zen, which obeys the sublimation from nature, came into Fanjingshan by Monk Mingran who studied from Monk Poshan in the 17th century. Zen tried to make a harmonious in order to maintain the compatible relationship between humans and nature. In the 18th century, Monk Shenchi used wood and stone outside the mountain during the Tianqing Temple reconstruction. The distinct culture of vegetarian food, tea and medicine played an indispensable role in Fanjingshan Buddhism (Wu, 2004). The local government forbade deforestation and encouraged conservation to protect Buddhist circumstance in the 19th century. At this time, a garrison officer named Wangshangkui and Buddhist believer, asked local people to protect the ecological environment without fishing or catching birds (The Research of Fanjingshan Buddhism Culture Relics in China, 2011).

2.a.5 Biodiversity

2.a.5.1 Division of biogeographical province of the nominated property

2.a.5.1-1 Biogeography

According to the classification of the biogeographical provinces of Udvardy (1975) (Figure 2.9), Fanjingshan lies in the Palaearctic Realm of eight biogeographical realms in the whole world, belonging to the Oriental Deciduous Forest, one of the 193 biogeographical provinces .

According to the identification of Chinese biogeographical divisions by Xie et al. (2002) (Figure 2.10), Fanjingshan is located on the border between Yuanjiang Catchment Montane Hill and Miaoling Hilly Pain in the Yangtze River Southern Bank Evergreen Broad-leaved Forest. Fanjingshan has a complex biota and a fund of rare and endangered species. It is the refuge of precious plants and the habitat of the endangered animals. It also lies on one of the world's famous bird migration paths.

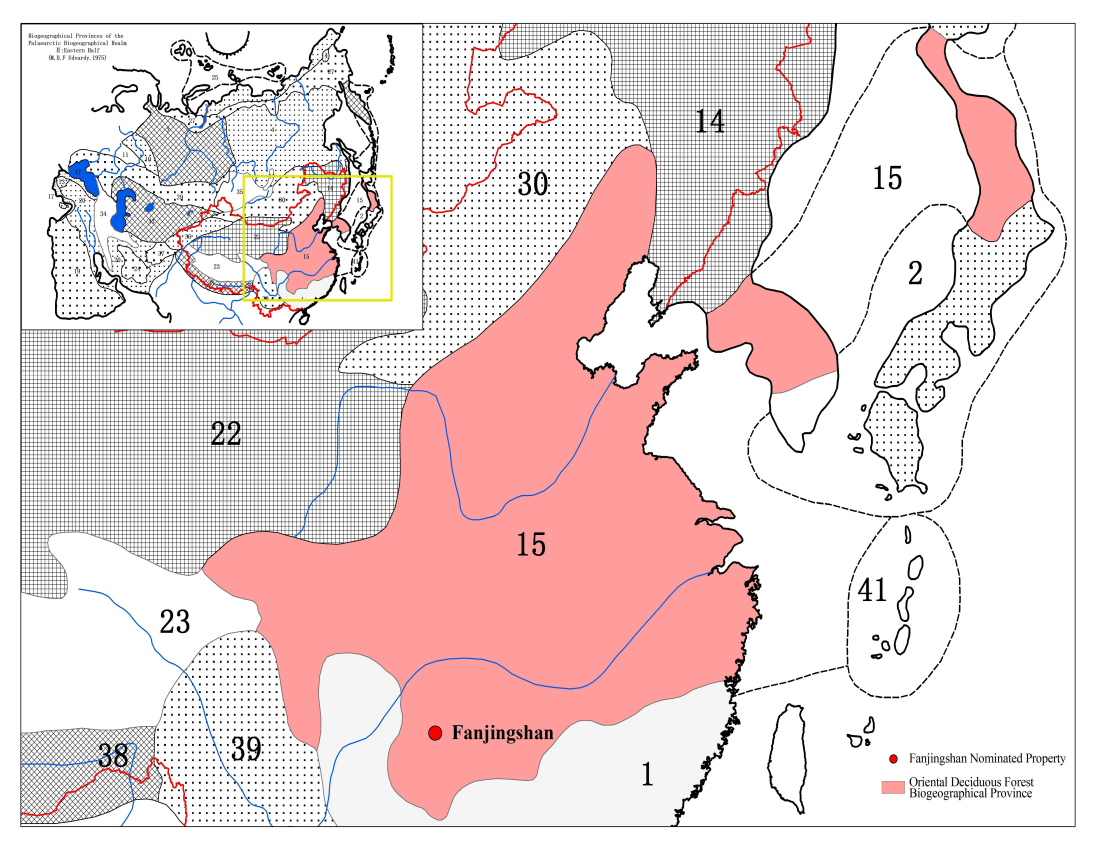


Figure 2.9 Location of the nominated property of Fanjingshan in the biogeographical provinces (Udvardy, 1975)

Figure 2.10 Location of the nominated property of Fanjingshan in China's Biogeographical Division Region (Xie et al., 2002)

2.a.5.1-2 Important protected properties

The significance of Fanjingshan has been recognized at various international, regional and national levels.

Membership of MAB Network: Fanjingshan has become one of the network members of MAB in 1986. Fanjingshan mainly protects subtropical forest ecosystems, rare flora and fauna, such as *Rhinopithecus brelichi* and *Davidia involucrate*. Fanjingshan is listed as a Class-A protected area of global significance.

Ecoregion protection status assessed by WWF: According to World Wildlife Fund (WWF), Fanjingshan is located in a critically endangered ecoregion, highly impacted by global change and human activities (Figure 2.11).

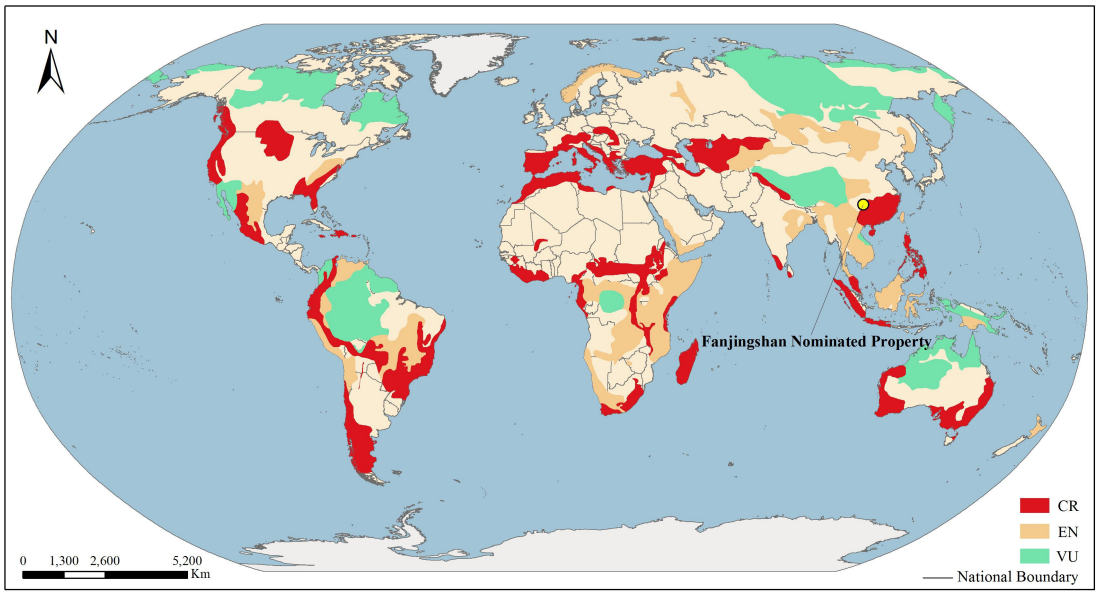


Figure 2.11 The protection status of the ecological area of the nominated property (www.panda.org)

Terrestrial Global 200 priority ecoregion: Fanjingshan is located in the Southeast China-Hainan Moist Forest of the Terrestrial Global 200 Ecoregions (G200_NUM: 23) (Olson et al., 2002) (Figure 2.12).

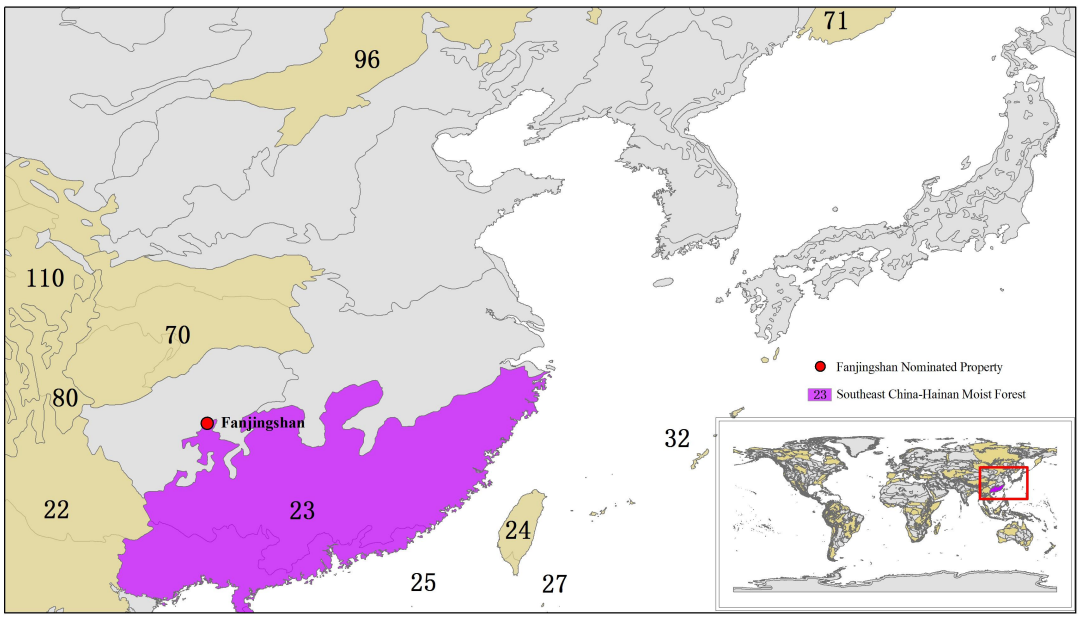


Figure 2.12 The location of the nominated property in the Terrestrial Global 200 Ecoregions (Olson et al., 2002)

Freshwater Global 200 priority ecoregion: Fanjingshan is located in Yangtze River & Lakes (G200_NUM: 149) of Freshwater Global 200 priority ecoregions (Figure 2.13).

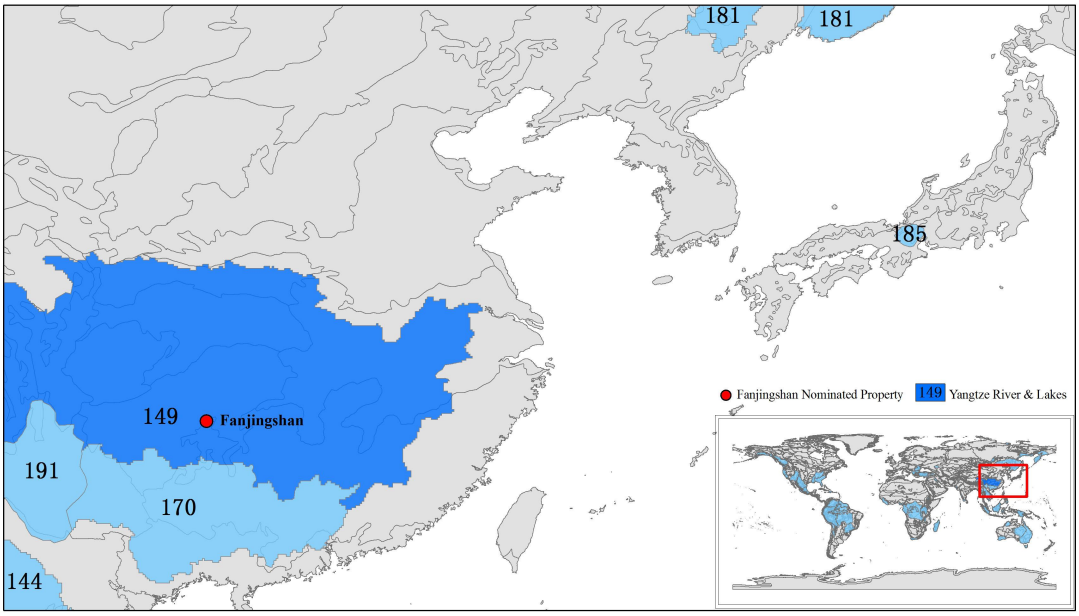


Figure 2.13 The location of the nominated property of Fanjingshan in the Freshwater Global 200 Ecoregions (Olson et al., 2002)

Endemic Bird Area: Endemic Bird Areas (EBAs), account for 4.5% of the world's land area, and represent priority regions in the context of broad-scale bird species conservation. Fanjingshan belongs to Chinese subtropical forest (NO.140; Area: 160,000 km^2; Altitude: 300-2,200 m; Priority: urgent; Habitat loss: severe) and South-east Chinese mountains (NO.141, Area: 610,000 km^2, Altitude: 300-1,900 m, Priority: Critical, Habitat loss: Severe) of EBAs.

The Convention on Biological Diversity-Important region of China Biodiversity Conservation Action Plan: Fanjingshan belongs to Wuling mountains noted within the Convention on Biological Diversity - China Biodiversity Conservation Action Plan (China Biodiversity Conservation Action Plan, 1994).

China's Nature Reserve: Fanjingshan was listed as a Guizhou Provincial Nature Reserve in 1982, and was elevated as a National Nature Reserve in 1986 (State Council, 1986). Protection objectives centre on rare flora and fauna and ecosystems composed of their habitats such as the *Rhinopithecus brelichi* and *Davidia involucrata*.

China's Important Bird Area: Fanjingshan is recognized as an important bird area (IBA) located in the mountains of southeast China within China's subtropical forest area, on the basis of the occurence of rare pheasants such as *Syrmaticus ellioti, Syrmaticus reevesii* (Chen et al., 2009).

Important region recognized within China's Biodiversity Conservation Strategy and Action Plan: Fanjingshan lies in the west central hilly area in the important region of China Biodiversity Conservation Strategy and Action Plan (Ministry of Environmental Protection of China, 2011).

2.a.5.2 Ecosystem values

2.a.5.2-1 Habitat types

According to the IUCN/SSC Global habitat area classification system, Fanjingshan has 6 first-level IUCN/SSC habitats, accounting for 53.84% of all first-level habits in the world; the main habitats include forests, shrublands, grasslands and wetlands, and all the above habitats compose of diverse terrestrial ecosystems and aquatic ecosystems (Table 2.7).

Table 2.7 IUCN/SSC first-level habitat types in the nominated property of Fanjingshan

First-level IUCN/SSC Habitat	The Nominated Property of Fanjingshan
1. Forest	√
2. Savannah	
3. Shrubland	√
4. Grassland	√
5. Wetlands (inland)	√
6. Rocky barren	√
7. Caves & Subterranean	√
8. Desert	
9. Sea	
10. Coastline/Intertidal	
11. Artificial–Terrestrial	
12. Artificial–Aquatic	
13. Introduced Vegetation	

2.a.5.2-2 Ecosystem types

Fanjingshan's unique evolution has resulted in a discrete miniature bioregion containing a series of component but connected ecological communities (Photo 2.50).

Photo 2.50 Ecological landscape in the nominated property

Forest Ecosystems: Fanjingshan is a forested montane ecosystem, comprising nine formations of evergreen broad-leaved forest (including bamboo forest), one formation of coniferous forest and deciduous broad-leaved forest at low elevation, mixed needle-leaved/broad-leaved forest and deciduous broad-leaved forest at mid-elevation, and moss coppice and shrublands at highest elevation. Important mid-elevation species include *Abies fanjingshanenesis, Tsuga chinensis* (Zhu, et al., 1990) (Table 2.8). The steep slopes, diverse geomorphology and climate gradients provide a variety of habitats for rare and endangered mammals, such as *Rhinopithecus brelichi*, *Panthera pardus*, *Neofelis nebulosa*, *Ursus thibetanus*, *Moschus berezovskii* and *Capricornis milneedwardsii*. At the same time, the forest ecosystems also play an important role in regional ecological balance and protection.

Table 2.8 Forest ecosystem types in the nominated property of Fanjingshan

Ecosystem Types	Distribution Height	Vegetation	Life form Spectrum	Photo
Evergreen broad-leaved forest in low mountains	Below 1,300-1,400 m	*Castanopsis rargesn - Engelhardia fenzelii*, *Castanopsis tibetana - Gachilus rehderi*, *Castanopsis carlesii* var.*spinulosa - Corylopsis multiflora*, etc.	Phanerophytes: 70.96% Chamaephytes: 1.58% Hemicryptophytes: 27.46%	
Coniferous forest in low mountains	Below 1,300 m	*Cunninghamia lanceolata*, *Pinus massoniana*, *Taxus chinensis*	--	

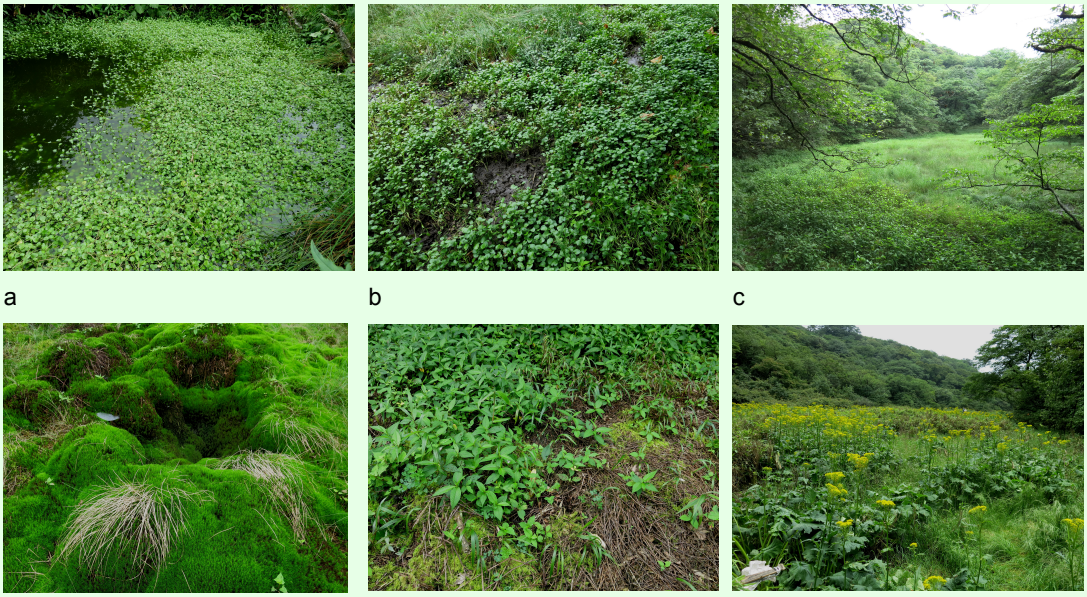
Secondary deciduous broad-leaved forest in low mountains	Below 1,300 m	*Pterocarya stenoptera*, *Alniphyllum fortunei*, *Populus adenopoda*, etc.	--	
Coniferous and broad-leaved mixed forest in middle mountains	1,300-1,900 m	*Pinus taiwanensis* var. *damingshanensis*, *Tsuga chinensis*	Phanerophytes: 55.97% Chamaephytes: 5.76% Hemicryptophytes: 37.39% Therophytes: 0.88%	
Evergreen and deciduous broad-leaved mixed forest in middle mountains	1,300-1,900 m	*Fagus lucida, Davidia involucrate*, *Cyclobalanopsis argyrotricha*, etc.	Phanerophytes: 59.41% Chamaephytes: 0.75% Hemicryptophytes: 39.50% Therophytes: 0.33%	
Moss coppice on tops	1,900-2,400 m	*Rhododendron*, *Cerasus serrulata*, *Acer*, *Cyclobalanopsis stewardianna*, etc.	Phanerophytes: 61.47% Chamaephytes: 3.12% Hemicryptophytes: 35.42%	
Shrub on high and middle mountains	2,000-2,570 m	*Rhododendron*, *Buxus*, *Ilex bioritsensis*, etc.	Phanerophytes: 35.12% Chamaephytes: 8.79% Hemicryptophytes: 50.65% Therophytes: 3.86% Cryptophytes: 1.58%	

Abies fanjingshanensis and *Tsuga chinensis* and broad-leaved mixed forest on high and middle mountains	2,100-2,350 m	*Abies fanjingshanensis*, *Tsuga chinensis*	Phanerophytes: 57.24% Hemicryptophytes: 42.76%	
Bamboo forests	800-2,500 m	*Bambusa Indocalamus*, *Chimonobambusa angustifolia*, etc.	Phanerophytes: 12.20% Chamaephytes: 10.84% Hemicryptophytes: 60.98% Therophytes: 7.32% Cryptophytes: 8.67%	

Wetland Ecosystems: Fanjingshan forms the divide between Wujiang and Yuanjiang river systems. Its small rivers, including the Panxihe, Waxihe, Heiwanhe, Macaohe, Niuweihe, Huangnigou, Liaojiahe, Kaituhe, Xiaojiahe, Taojinhe, Yujiagou, Yuquangou and Luanshihe, are distributed in a radial pattern. Recharged by forest water storage and precipitation, there are many torrents, dangerous shoals and waterfalls along these perennial rivers due to the steep gradients. High water quality with pH 5.5-6.5 supplies natural habitats for threatened species such as giant salamander *Andrias davidianus* and *Leptobrachium boringii*. The terrestrial-aquatic interlaced zones of these rivers not only preserve relatively high biological diversity, but also create a concentrated refuge for many rare and relict plant species like *Abies fanjingshanensis*, *Davidia involucrate*, *Tsuga chinensis*, *Tetracentron sinense* and *Fagus longipetiolata* (Photo 2.51-2.52).

Photo 2.51-2.52 Wetland ecosystems

Among the existing swamp vegetation, there are 5 community succession series in the vegetation of Jiulongchi (2,030 m), namely *Polytrichum commune*, *Eleocharis yokoscensis-Cyperus glomeratus, Ranunculus ficariifolius-Poa annua*, *Senecio faberil* and *Indocalamus tessellates*. *Sphagnum nemoreum* exists in the local depressions like Lanchading (2,320 m), Old Jinding (2,230 m), and the area of moss swamp is small, suggesting that it is in the later stage of succession (Huang, et al., 1986) (Photo 2.53).



a b c

d e f

Photo 2.53 Succession process from swamp vegetation to xerophytic vegetation in Jiulongchi (a, b, c: swamp vegetation; d, e: late stage of swamp vegetation; f: xerophytic vegetation)

Grassland Ecosystems: Subalpine meadows in Fanjingshan are located on table-shaped mountains with bare rocks or partial districts near the mountain tops where there are low temperatures, foggy weather and high relative humidity. Species compositions within these subalpine meadows are relatively diverse with main species including *Pedicularis* spp., *Cyperus* spp., *Halenia corniculata*, *Gentiana scabra*, *Angelica megaphylla*, *Codonopsis lanceolate*, *Scrophularia regelii*, *Pyrola japonica*, *Hypericum erectum*, *Smilacina henryi*, *Eleocharis yokoscensis* and *Diphasiastrum complanatum* (Photo 2.54).

Photo 2.54 Grassland ecosystem

Rocky Barren Ecosystems: On the summit, small areas of bare rocks which usually form the classical landscapes of Fanjingshan, such as New Jinding, Old Jinding, Laoyingyan, Mogushi, Wanjuanshu and Jiandaoxia, consist mainly of metamorphic rocks. These areas host diverse lichens, mosses and ferns due to the changeable weather, abundant precipitation and high wind velocity. Additionally, many plant species, such as *Lycopodium japonicum*, *Brachythecium perminusculum*, *Dicranodontium denudatum*, including Fanjingshan-endemic plant species like *Hylotelephium fanjingshanense* and *Sinosenecio fanjingshanicas* grow in the crevices (Photo 2.55).

Photo 2.55 Bare rock ecosystem

Cave Ecosystems: Caves of different sizes like Lianyu Cave and Xianren Cave were formed by a variety of internal and external geological processes are located in the west of the nominated property and karst areas in the buffer zone. These caves possess a distinct ecosystem and relatively high cave biodiversity. Threatened species like the rare frog *Oreolalax rhodostigmatus* often inhabit these caves (Photo 2.56).

Photo 2.56 Cave ecosystem

2.a.5.3 Plant diversity

Fanjingshan is located in a floristic intersection zone with diverse vegetation types, complex plant geographical elements, obviously transitional flora. As a result, Fanjingshan possesses plentiful plant species including rare and endangered plant species. It has recorded 4,394 species of wild plants, 230 species of rare and endangered wild plants, 46 species of which are endemic to Fanjingshan and 1,010 species endemic to China.

2.a.5.3-1 Floristic elements

As for the plant geographic relationships, according to the partition system proposed by Takhtajan (1988), Fanjingshan belongs to the East Asia area, north subzone and Holarctic zone. According to the partition system proposed by Wu (2011) for Chinese flora, Fanjingshan belongs to Hubei, Hunan and Sichuan area, Central China area, China-Japan forest plant subzone and East Asia plant zone (Figure 2.14).

Figure 2.14 The location of Fanjingshan in the plant geographic division of China proposed by Wu (2011)

From the perspective of the composition of floristic elements, a large number of older components have been preserved in Fanjingshan, including the Pinaceae, Cupressaceae of the Jurassic Period and Fagaceae of the Rou Yi plant inflorescence of Cretaceous period that are still constructive components of Fanjingshan's forest vegetation. At the same time, a number of relatively young components have also been preserved in Fanjingshan, including *Primula, Rhododendron* and *Gentiana* which were differentiated by the Himalayan orogenic movement. They are not only widely distributed here, but also many of them are endemic species.

The phytogeographical components of Fanjingshan are extremely complicated, with 14 of the total 15 distribution-patterns of Chinese spermatophytes present, except for the Central Asia areal-pattern. The tropical element accounts for 43.59%, in which the pantropic pattern (15.91%) and tropical Asia pattern (11.51%) are dominant. The North Temperate element accounts for 34.28%, in which the North Temperate pattern is the largest component, accounting for 19.02% of the total genera. East Asia element accounts for 21.48%, in which East Asia pattern accounts for 16.31% and China

endemic pattern accounts for 5.17%. In general, the major genera of seed plants in Fanjingshan is dominated by temperate components (56.41%) (Including North Temperate, Ancient Mediterranean and East Asia elements), followed by tropic elements (43.59%) (Table 2.9). Obviously, it is a refugium for the northern plants moving south as well as a habitat for the southern plants moving north because of its specific geographic location and diverse natural environments (Zhou et al., 1990). Fanjingshan became a convergence for a variety of floristic geographic components, with obvious transitivity of species composition and flora.

Table 2.9 Phytogeographical components in the nominated property of Fanjingshan

Areal-patterns	Genus Number	Percentage %	Floristic Elements	Genus Number	Percentage %
Cosmopolitans	70	——	Cosmopolitans	70	——
Pantropic	123	15.91	Tropic element	337	43.59
Tropical Asia to Tropical America	14	1.81			
Old World Tropics	46	5.95			
Tropical Asia to Tropical Australia	33	4.27			
Tropical Asia to Tropical Africa	32	4.14			
Tropical Asia	89	11.51			
North Temperate	147	19.02	North temperate element	265	34.28
East Asia and North America disjuncted	60	7.76			
Old World Temperate	50	6.47			
Temperate Asia	8	1.03			
Mediterranean, West Asia to Central Asia	5	0.65	Ancient Mediterranean element	5	0.65
East Asia	126	16.31	East Asia element	166	21.48
Endemic to China	40	5.17			
Total	773	100	Total	773	100

Note: Cosmopolitans were not included in statistical analysis

2.a.5.3-2 Plant species

The rich and diverse plant flora of Fanjingshan results from its special geographical location, complex terrain, multifarious mountain three-dimensional climate and diverse habitats. There are 390 families, 1,462 genera, 4,394 species of wild plants recorded in Fanjingshan; 36 families, 63 genera, 99 species of freshwater algae; 22 families, 47 genera, 119 species of lichens; 65 families, 179 genera, 452 species of macrofungi; 77 families, 241 genera, 791 species of Bryophyte; 28 families, 89 genera, 349 species of Pteridophyte; 7 families, 20 genera, 36 species of Gymnospermae; and 155 families, 823 genera and 2,548 species of angiosperms, so its plant species diversity is extremely rich (Table 2.10).

The border area of Guizhou, Chongqing, Hunan and Hubei, where Fanjingshan located

in, is one of the three Chinese moss distribution centers (Yang, et al., 2007). Fanjingshan is one of the three East Asia distribution centers with endemic genera of bryophyte. There are 75 endemic moss plants (including 1 species endemic to Fanjingshan: *Distichophyllun oblongum* var. *fanjingensis*). The nominated property is extremely rich in mosses, only second to Hengduan Mountains (The Editorial Committee of Fanjingshan, 2014).

Table 2.10 Wild plant species in the nominated property

Phylum	Family	Genus	Species	Percentage /%
Freshwater algae	36	63	99	2.25
Lichen	22	47	119	2.71
Macrofungis	65	179	452	10.28
Bryophyta	77	241	791	18.01
Pteridophyta	28	89	349	7.94
Gymnospermae	7	20	36	0.83
Angiospermae	155	823	2,548	57.98
Total	390	1,462	4,394	100

2.a.5.3-3 The most abundant and unique gymnosperms of the nominated property worldwide

The nominated property has recorded 36 species of gymnosperms belonging to 20 genera, 7 families, occupying respectively 58.33%, 26.67% and 4.5% of the families, genera and species of the entire world, so that as the mountain with the most abundant diversity and most concentrated distribution of gymnosperms worldwide, the nominated property is significant for the conservation and evolutionary study of the world's gymnosperms. There are 28 gymnosperm species endemic to China, occupying 21.54% of all the Chinese endemic gymnosperms, which provides strong evidence that Fanjingshan is an important distribution centre of gymnosperms in China. *Abies fanjingshanensis*, an endemic, rare, endangered and relict gymnosperm species, has unique biological and ecological significance worldwide.

Abies fanjingshanensis

Abies fanjingshanensis, endemic to Fanjingshan, is one of the four rare and endangered species that live in Chinese subtropical middle-high mountains in genus *Abies* (Pinaceae) which is the major component of dark coniferous forests in north temperate regions(Photo 2.58). In 1981, a scientific group, focusing on the question whether *Abies* is distributed in Guizhou, specifically took field investigations at areas that *Abies* may be adapted to, and finally found *Abies* forest in Fanjingshan. After the scientific identification, the *Abies* found in Fanjingshan was recognized as a new species and was named as *Abies fanjingshanensis*, because Fanjingshan is the only known distribution area (Huang

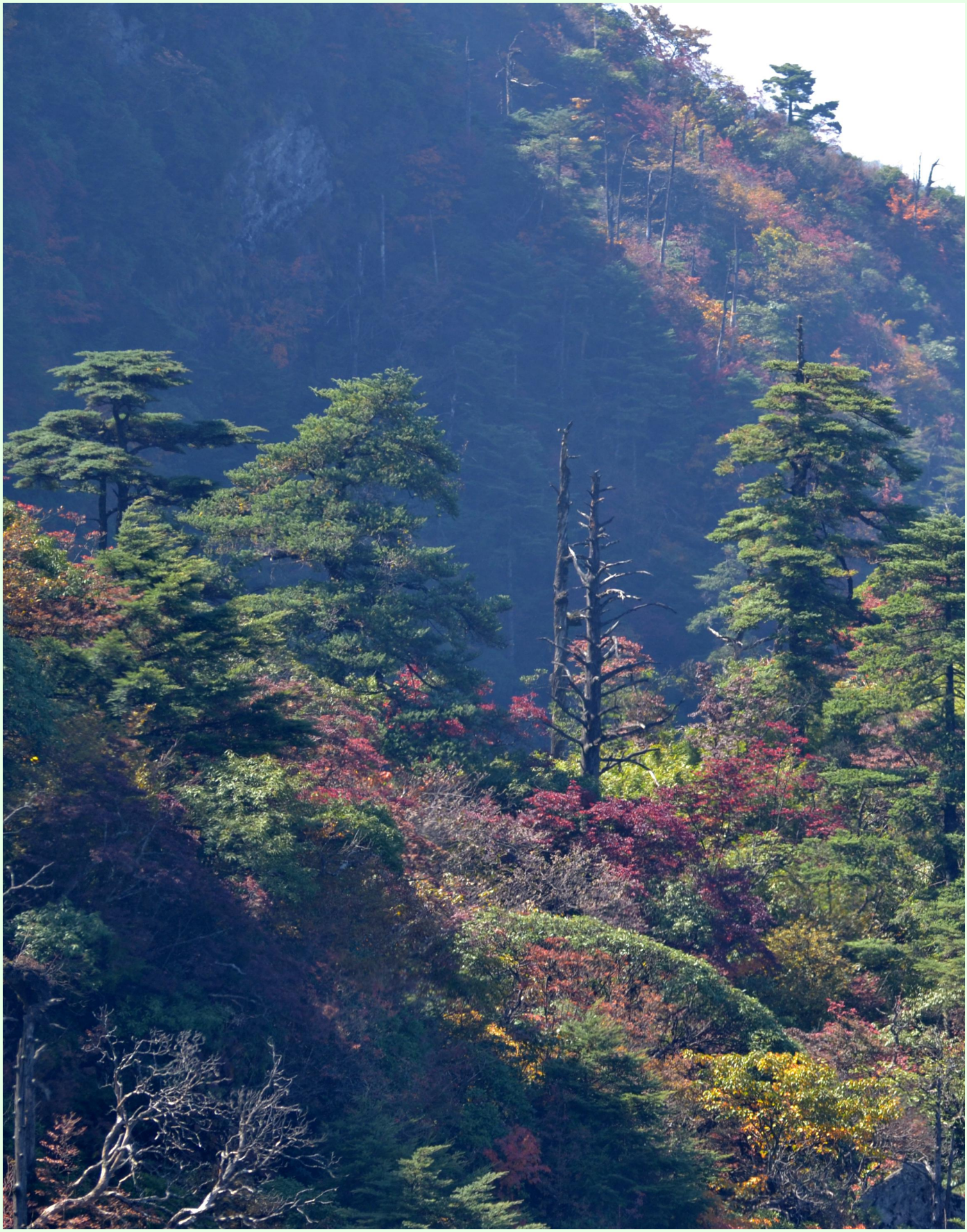


Photo 2.58 The community of *Abies fanjingshanensis* in the nominated property

et al., 1982) (Photo 2.57). The 4 subtropical rare and endangered *Abies* species must be a great discovery in Plant Geography that contradicts the opinion that there were no *Abies* at low and middle mountains of subtropical area (Xiang, 2001; Li, 1995) and *Abies fanjingshanensis* became the latest *Abies* species that had been found up to now. *Abies fanjingshanensis* was classified as a worldwide protected coniferous species by IUCN in its “Conifer Action Plan” (1998), classified as an endangered species (EN) by IUCN Red List (2015), and a national class I protected plant species.

The results of *Abies* fossil research and community floral-element analysis show that *Abies fanjingshanensis* belongs to a significantly unique species type originated from local southwestern mountains in China (Huang, 1982). *Abies fanjingshanensis* is only distributed over the cool humid north slopes of Lanchading, Baiyunsi and Juchishan areas with elevation range 2,100 m to 2,350 m (Figure 2.15). The population of *Abies fanjingshanensis* is characterized by a low growth type and a distribution pattern with narrow and fragmented aggregation. The area of *Abies fanjingshanensis* forest is only about 30 ha and the wild population is about 10,000 (in *Research on Fanjingshan*, 1990). Due to the relatively stronger parent plants, limited seedlings and high seedling death rates, the natural regeneration ability of *Abies fanjingshanensis* is low (Li, 2013). The results of field monitoring in 2015 and sample-plot survey in 2016 showed there were several dead trees within the sample plot (with the proportion of 14%) and that the wild population was reduced seriously and further endangered. The cause of serious decrease of population may be the mega hail disaster in May, 1986, the weak natural regeneration ability and the rich sphagnum mosses under the forest which may starve the roots for oxygen leading to dieback (Xiang, 1998).

Photo 2.57 Fanjingshan fir (*Abies fanjingshanensis*)

The community of *Abies fanjingshanensis* lives within distinctive habitat parameters including lower temperature, high humidity and shallower soil layer. The micro relief of *Abies fanjingshanensis* is usually shaded or half-shaded steep slopes to the north near the ridge lines, sometimes the incline can reach 50°-60°. The climatic conditions of the distribution areas of *Abies fanjingshanensis* can be characterized by mean annual temperature of 7.1℃, annual precipitation of 1,313.8 mm and annual relative humidity of 80.75%. The under-forest soil is acid loamy mountainous yellow brown soil (Huang, 1982).

Abies fanjingshanensis forest is growing in the biotopes where few people tread and forms a stable community under the conditions of natural environment. The sample-plot survey of the community shows that there are abundant plants with 35 families, 45 genera and 69 species have been recorded in *Abies fanjingshanensis* forest. In addition to herb stratum, the quantities of species in each stratum all make up over 11% of the total species based on sample-plot survey of vegetation vertical belts in Fanjingshan. This shows that *Abies fanjingshanensis* community owns relatively high plant species diversity. Meanwhile, *Abies fanjingshanensis* forest, a special forest type of subalpine dark coniferous forest, has formed unique biotopes, community components and floral elements in Fanjingshan, which can be characterized as follow: Evergreen coniferous plants like *Abies fanjingshanensis* and *Tsuga longibracteata* are dominated in tree stratum, but also some evergreen or deciduous broad-leaved species; The dominant species mainly belong to *Fargesia* and *Rhododendron* in shrub stratum, also including several south and north species; There are plenty of locally endemic species in herb stratum such as *Leontopodium fangingense* and *Corybas fanjingshanensis*; Ground stratum and inter stratum have abundant bryophyte and some of them are not be found yet in other communities in Fanjingshan like *Sphagnum* and *Breutelia arundinifolia*.

Abies fanjingshanensis community has enriched the flora of China, added a new vegetation type and community type for subalpine dark coniferous forests in China and contributed new vertical belts of dark coniferous forest for subalpine of the mid-subtropical zone. *Abies fanjingshanensis*, located in the region affected by both the Pacific monsoon in the east and the Indian monsoon in the southwest, shows a transitional character consistented with flora associated with both monsoons, so it is theoretically and practically valuable to study in the natural ecological environment, populations and communities of this species in the wild. In addition, as a relict species since the Tertiary Period, *Abies fanjingshanensis* represents a valuable gene pool preserved in Fanjingshan, which will provide important support for the researches in paleoclimatology, paleobotany, geology, etc.

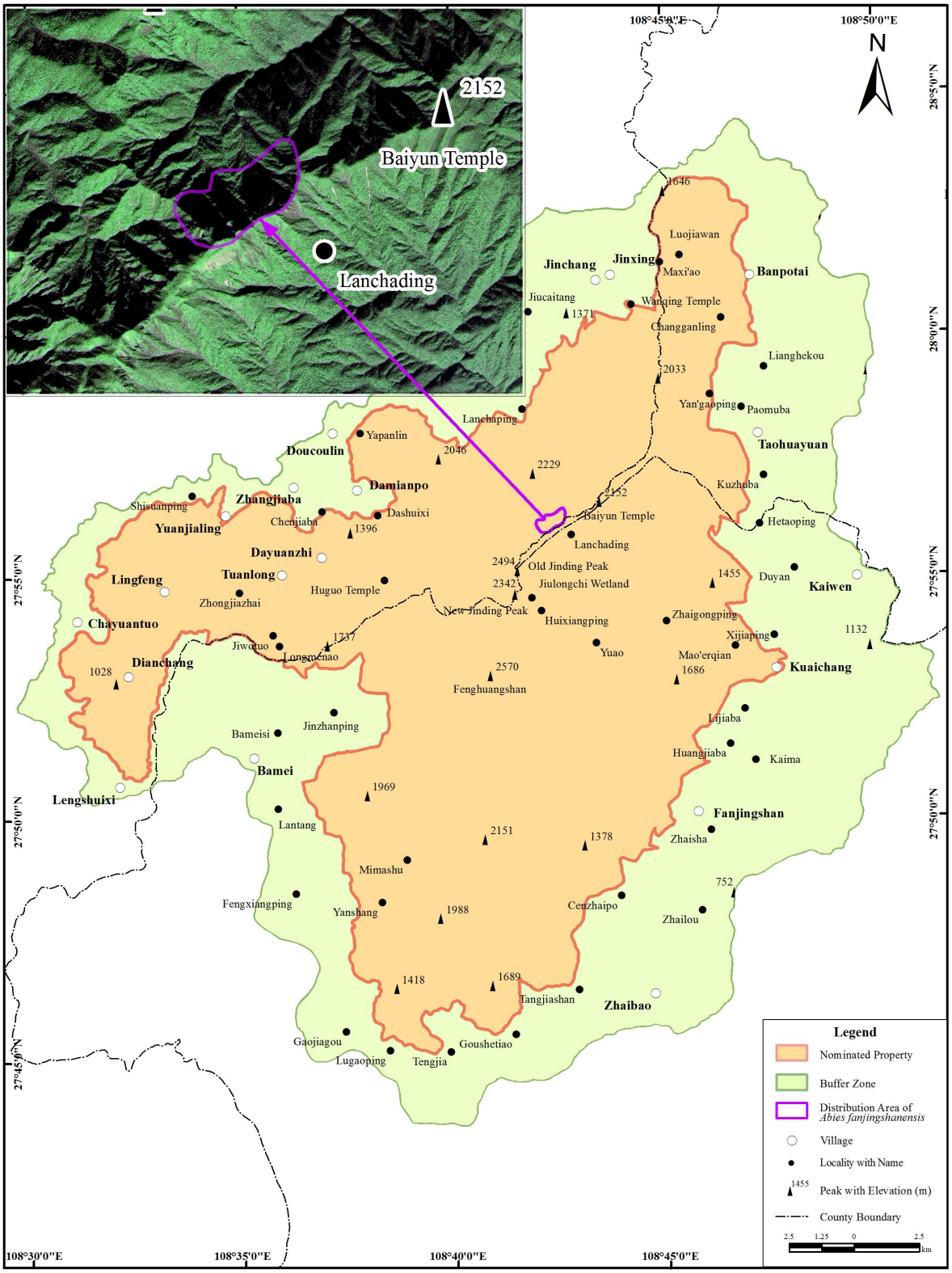


Figure 2.15 The distribution of *Abies fanjingshanensis*

The unique geographical environment and landforms make it possible that *Abies* plants are distributed in the subtropical area. Multi-site conditions interact to form suitable habitat environment for *Abies fanjingshanensis*. The distinctive composition of the species of *Abies fanjingshanensis* forest supports the survival and propagation of *Abies fanjingshanensis* and the stability of the community. Especially, among *Abies fanjingshanensis*, *Corybas fanjingshanensis* and bryophyte under the forest, there is a mutualism relationship in maintaining suitable habitat for each other. *Corybas fanjingshanensis*, a species of *Coryba*, Orchidaceae endemic to Fanjingshan, which is characterized by small shape, huge flower, rare and beautiful appearance, strict environment demand and only living in the highly humid and clustered bryophyte communities, is only found in the *Abies fanjingshanensis* forest so far (Xiong et al., 2007). *Abies fanjingshanensis*, with properties of adapting to humid and cool environment, evergreen leaves and high crown density, make understory a relatively humid habitat that in favor of the enrichment growth for bryophyte. Meanwhile, those highly clustered bryophyte represented by *Sphagnum junghuhnianum*, *Dicranodontium filifolium*, etc. also keep the near ground and subsurface soil humid, which ensure the growth of *Abies fanjingshanensis* and also provide a suitable habitat for the survival and propagation of *Corybas fanjingshanensis*.

Because of the extremely specific habitat condition requirements, especially climatic requirements, *Abies fanjingshanensis* has a narrow ecological amplitude and significant feedback to several interference impacts, and as it will potentially be invaded and replaced by sunshine loving species and deciduous species. Furthermore, if the population of *Abies fanjingshanensis* precipitately falls, the humid habitat of understory will disappear and cause the degeneration of bryophyte and secondary extinction of locally endemic species like *Corybas fanjingshanensis*. Therefore, the significance of strengthening the studies and conservation of *Abies fanjingshanensis* is not only to preserve this rare and endangered species, but also to protect the species diversity and endemic species within the community.

2.a.5.3-4 Endemic plants

(1) Plants endemic to Fanjingshan

The special geographical location, varied terrain and unique climate make Fanjingshan a complex small habitat, which renders Fanjingshan an important region for differentiation and development of many endemic plants. As a large mountain which was the earliest dry land of the Guizhou Plateau, Fanjingshan provides a special evolution space for paleo plant development. There are 46 species restrictedly endemic to Fanjingshan belonging to 41 genera in 27 families (Table 2.11), including *Abies fanjingshanensis*, *Manglietia fanjingshanensis, Actinidia fanjingshanensis, Hylotelephium fanjingshanense,*

Sinosenecio fanjingshanicus, Dendrobium fanjingshanense, Corybas fanjingshanensis, Androsace medifissa, Allium fanjingshanensis, etc. The plants endemic to Fanjingshan have the following characteristics:

①Some ancient endemic plants (*Abies fanjingshanensis, Manglietia fanjingshanensis*) are restricted to the property as well as many recent endemic plants (*Impatiens fanjingshanica, Primula fangingensis*) are contained;

②Most endemics belong to typical families that contain north temperate elements and there are 11 species belonging to 7 families, including Asteraceae, Berberidaceae and Elaeagnaceae, etc. Among the endemic plants, there are also some families with tropical affinities. There are 8 species belonging to 5 families, including Ebenaceae, Balsaminaceae and Gesneriaceae.

③The distribution of endemic plants is highly correlated with unique natural conditions. For example, *Abies fanjingshanensis* is only distributed in the upper part of northern slope, and *Androsace medifissa* and *Hylotelephium fanjingshanense* is only distributed in the highest locations. The clustered distribution of endemic plants is found at the top of the mountains. For instance, *Androsace medifissa* and *Primula fangjingensis* are found in a range of 1 square meter from each other.

Table 2.11 Endemic plants in the nominated property

Phylum	Plants Endemic to Fanjingshan	Plants Endemic to China
Lichen	0	1
Bryophyta	1	74
Pteridophyta	3	73
Gymnospermae	1	19
Angiospermae	41	843
Total	46	1010

Within all of the locally endemic plants have been recorded in Fanjingshan, there are several spectacular species, such as *Sedum fanjingshanensis* which looks like the bottom of lotus seed (Yang et al., 2012); *Corybas fanjingshanensis* (Orchidaceae) which is characterized by small shape, huge flower, leaves with decorative pattern and scattered type in the moss community with high humidity environment (Tang et al., 1951; Xiong et al., 2007); *Epimedium brachyrrhizum*, *Dendrobium fanjingshanense*, *Codonopsis argentea, Actinidia fanjingshanensis* all of which are valuable in officinal use (Jin et al., 2001; Zhang et al., 2001); and *Primula fangingensis*, *Impatiens fanjingshanica, Androsace medifissa* all of which have highly ornamental value (Xiong et al., 2009) (Photo 2.59-2.67).

Photo 2.59 ***Sedum fanjingshanensis***

Photo 2.60 ***Corybas fanjingshanensis***

Photo 2.61 ***Epimedium brachyrrhizum***

Photo 2.62 ***Dendrobium fanjingshanense***

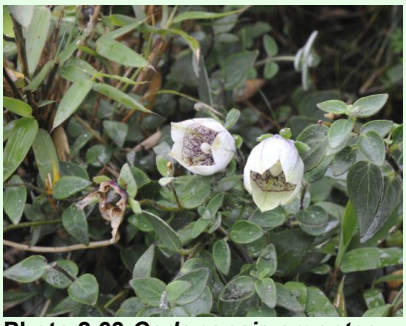


Photo 2.63 ***Codonopsis argentea***

Photo 2.64 ***Actinidia fanjingshanensis***

Photo 2.65 ***Primula fangingensis***

Photo 2.66 ***Impatiens fanjingshanica***

Photo 2.67 ***Androsace medifissa***

(2) Plants endemic to China

There are 1,010 species endemic to China distributed in Fanjingshan, including 858 endemic species of spermatophyte. For example, *Pseudotsuga sinensis*, the only species of *Pseudotsuga* that can form standing forest and also the representative relict species of Central China flora, is distributed in the nominated property in pure forest (Photo 2.68). *Zenia insignis*, a species of Leguminosae with important status of systematics, is distributed in the northern edge of the nominated property and has certain connection with the karst plants in the buffer zone (Photo 2.69). *Eucommia ulmoides*, the only relict species of Eucommiaceae, is described as “the rubber wood of China”. And *Yulania liliiflora* is used as medicine with a history of over 2,000 years and highly ornamental value.

Photo 2.68 *Pseudotsuga sinensis*

Photo 2.69 *Zenia insignis*

2.a.5.3-5 Rare and endangered plants

There are 64 families, 149 genera and 230 species of rare and endangered wild plants recorded in Fanjingshan, among which, 64 species are on the IUCN Red List, including *Kurzia sinensis* (CR), *Bretschneidera sinensis* (EN) and *Panax zingiberensis* (EN), etc., 188 species are on the Chinese Red List, including *Gastrochilus nanu* (CR), *Dendrobium officinale* (CR) and *Calanthe tsoongiana* var. *guizhouensis* (CR), 88 species are on the CITES appendixes, including *Paphiopedilum micranthum* (Appendix Ⅰ), *Taxus wallichiana* var. *mairei* (Appendix II) and *Corybas fanjingshanensis* (Appendix Ⅱ), etc., and 47 species are on the National Key Protected Plants, including *Taxus chinensis* (Class Ⅰ), *Bretschneidera sinensis* (Class Ⅰ), *Davidia involucrata* (Class Ⅰ), *Magnolia officinalis* subsp. *biloba* (Class Ⅱ), *Machilus nanmu* (Class Ⅱ) and *Eurycorymbus cavaleriei* (Class Ⅱ), etc. (Table 2.12) (Figure 2.16).

Table 2.12 Rare and endangered plants in the nominated property

Phylum	IUCN Red List (2016)					CITES Appendixes (2013)			Chinese Key Protected Plants (2004)		Chinese Red List (2004)			
	EX	CR	EN	VU	NT	I	II	III	I	II	CR	EN	VU	NT
Bryophyta	0	1	0	0	0	0	0	0	2	4	1	0	1	1
Pteridophyta	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Gymnospermae	0	0	4	6	3	0	2	1	6	6	1	4	9	9
Angiospermae	0	3	15	20	9	1	84	0	4	25	6	27	96	33
Total	1	4	19	28	12	1	86	1	12	35	8	31	106	43

Among these rare and endangered plants, there are *Bretschneidera sinensis*, a monotypic-family and relict species endemic to China, which belong to the ancient tropical flora in the Tertiary Period that is valuable in scientific researches of the phylogenesis of Angiosperm, paleogeography and paleoclimatology, and which is named as “the dragon and phoenix of plants” (Photo 2.70), and *Taxus wallichiana* var. *Mairei*, a

worldwide rare and endangered plant, which contain the taxinol, a kind of anticancer active substance (Photo 2.71).

Photo 2.70 ***Bretschneidera sinensis***

Photo 2.71 ***Taxus wallichiana*** **var.** ***mairei***

2.a.5.3-6 Relict plants

Fanjingshan, with a long geological history, was uplifted to be land after experiencing Fanjing-Wuling movement and Xuefeng movement. Its modern mountain landform of was basically formed by Late Mesozoic Yanshan movement and early Cenozoic Himalaya movement and this is the critical period in the development and evolution of seed plants, because the relative stability of the topography is beneficial to the development of seed plants. Fanjingshan had warm climate conditions from the Triassic to the end of the Tertiary and the temperature was 5-10℃ higher than that of today. According to modern biological evolution theory, the typical temperature of species evolution is 37℃, which not only keeps the considerable free energy of biological bodies, but also ensures that a wide variety of activities can be carried out at high speed with multiple and lasting changes. Therefore, the climate condition of Fanjingshan was conducive to the origin and distribution of all kinds of plant communities.

The temperature of Fanjingshan was still high, but the degree of desiccation increased from the end of the Jurassic to Triassic Period, which made the previous flora composition of Fanjingshan change and the dry floral elements gradually infiltrate here. The climate was cold during the Quaternary Ice Age, but the climate was warm during inter-glacial periods. This climatic phenomenon of alternating cold and warm had a great effect on flora composition, making the plants evolve in two directions, respectively: the ecological amplitude became wide (generalization) and the ecological amplitude became narrow (specialization).

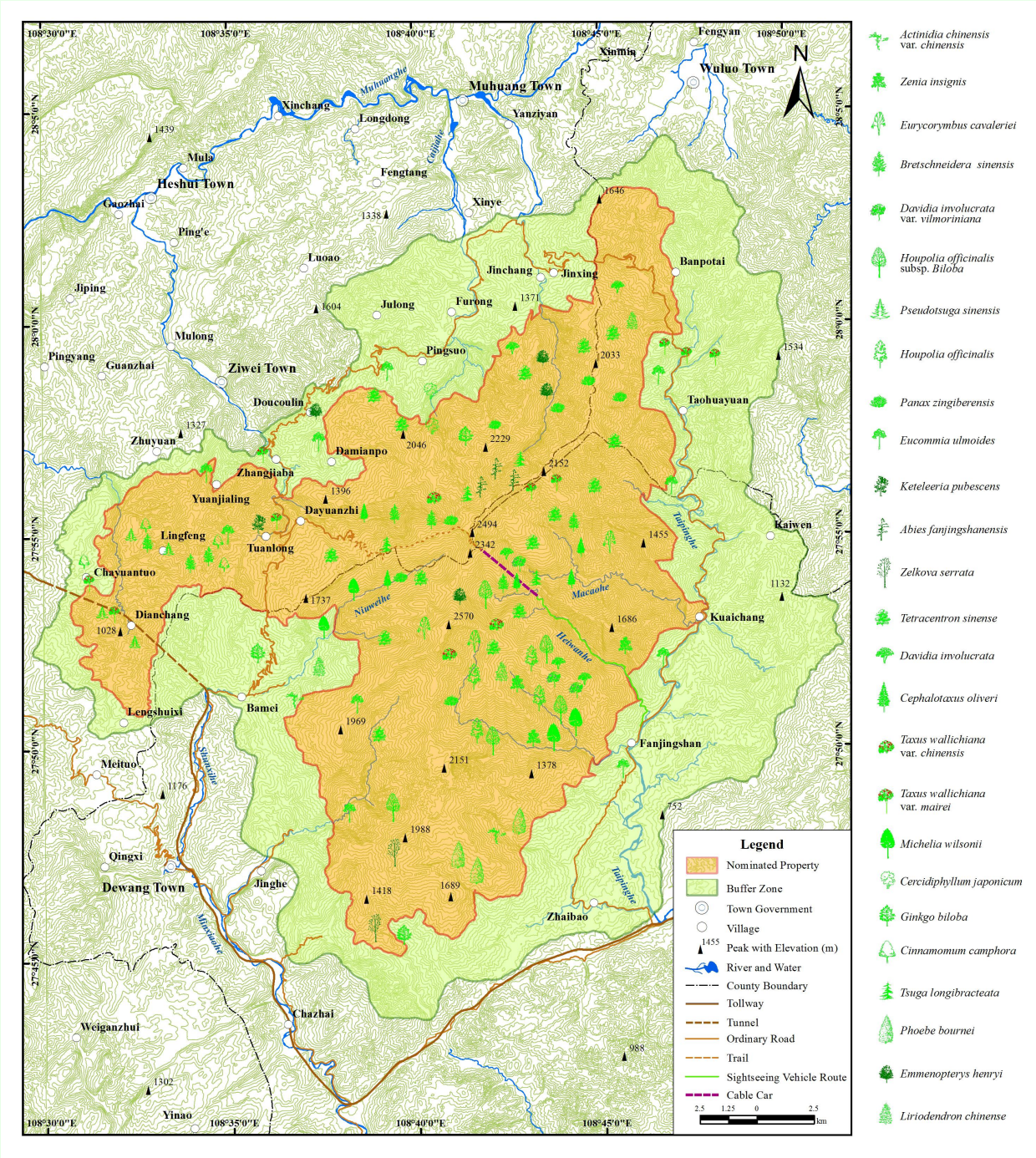


Figure 2.16 Distribution of rare and endangered plants in the nominated property

Due to less influence from the Quaternary Glacial Period and the role of the mountain as a Pleistocene refuge, Fanjingshan has retained many kinds of relict plants. The relict plants belong to 174 genera (18.6% of the total genera of vascular plants) and 64 families (33.51% of the total family of vascular plants) of vascular plants and 19 genera (95% of the total genera of gymnosperms plants) and 7 families (100% of the total families of gymnosperms) of gymnosperms in the Tertiary Period. The paleo-ferns Pteridophyta include *Lycopodium* and *Selaginella* which flourished in the Late Paleozoic

Era. There are 7 families, 19 genera, 35 species of paleo gymnosperm including *Ginkgo biloba*, *Abies fanjingshanensis*, *Tsuga chinensis*, *Tsuga longibracteata*, *Keteleeria pubescens*, *Cunninghamia lanceolata*, *Taxus wallichiana* var. *mairei* and *Mentotaxus argotoenia* which were found in Tertiary or earlier Cretaceous. There are many paleo angiosperm including Magnoliaceae, Eupteleaceae, Cercidiphyllaceae, Lauraceae, Fagaceae, Hamamelidaceae, etc. *Fagus longipetiolata*, *Cyclobalanopsis glauca*, *Castanopsis* and *Lithocarpus glaber* are the main constructive species of evergreen broad-leaved forest and deciduous, evergreen broad-leaved mixed forest in Fanjingshan, and are also the main components of the primary forest. There are plenty of relict plants in these primary angiosperms including *Davidia involucrate*, *Liriodendron chinense*, *Dipteronia sinensis*, *Cyclocarya paliurus*, *Tetracentron sinense*, *Cercidiphyllum japonicum* and so on originating in the Tertiary Period or even earlier.

In addition, Fanjingshan has 6 monotypic families, 6 single-genus families, 43 monotypic genera and 111 oligotypic genera. Monotypic or single-genus families include Eucommiaceae, Bretschneideraceae, Tetracentronaceae, Cercidiphyllaceae, Eupteleaceae, Rhoipteleaceae, Phrymataceae, etc. Monotypic or oligotypic genera include *Pseudolarix*, *Taiwania*, *Camptotheca*, *Eurycorymbus*, and *Emmenopterys*, etc. Some of those families and genera are endemic to China and have ancient origins.

Fanjingshan possesses an abundance of ancient and relict plants that show primitive features and are primordial and isolated in systemic evolution. This shows that it was an important refuge for many ancient and relict plants and remains an important place for evolution and development of modern vegetation (Table 2.13).

Table 2.13 Statistics of family and genus of Tertiary relict vascular plants in the nominated property

Division	Family	Genus
Pteridophyta	6	6
Gymnospermae	7	19
Angiospermae	51	149
Total	64	174

The nominated property is located in the southwest margin of the Central China flora and adjacent to Hengduan flora and South China flora. Due to the significant drop in temperature during a relatively long geological history in the Quaternary glacial period, the distribution area of plants in north temperate regions gradually retreated and then moved to the south. Soon afterwards, along with the speedy end of the post-glacial age, those plants had not enough time to move back to the north, so they could only survive and propagate at higher altitude on the southern mountains. Thus, the nominated property has conserved a lot of Tertiary and Quaternary ancient relict plants, such as *Abies fanjingshanensis* as well illustrated (Table 2.14).

Table 2.14 Rare, endangered and Tertiary and Quaternary ancient relict plants in the nominated property

Species	Species
Tertiary	
Abies fanjingshanensis	*Davidia involucrate*
Pseudolarix amabilis	*Davidia involucrata* var. *vilmoriniana*
Cathaya argyrophylla	*Tetracentron sinense*
Keteleeria pubescens	*Rhoiptelea chiliantha*
Taiwania cryptomerioides	*Cercidiphyllum japonicum*
Liriodendron chinense	*Bretschneidera sinensis*
Phellodendron amurense	*Eurycorymbus cavaleriei*
Quaternary	
Ginkgo biloba	*Tapiscia sinensis*
Michelia wilsonii	*Emmenopterys henryi*
Fagus longipetiolata	*Metasequoia glyptostroboides*

Among the ancient and relict plants in the Tertiary Period that have been recorded, there are several species owning important status in genealogical classification of plants, such as *Davidia involucrate* which is named as “the living fossil” and “the Green Panda”, *Tetracentron sinense*, a monotypic-genus species which are lack of vessel, and *Liriodendron chinense* whose leaves look like mandarin jacket and which has important significance for studies in geological and climatic change in the Northern Hemisphere.

Photo 2.72 *Davidia involucrate*

Photo 2.73 *Tetracentron sinense*

Photo 2.74 *Liriodendron chinense*

Photo 2.75 *Cercidiphyllum japonicum*

2.a.5.3-7 Type specimen plants

Fanjingshan is an extremely important locality where many type plant specimens were found. There are 64 wild species, whose subspecies belong to 38 families 55 genera (Xiong et al., 2009) (Table 2.15), accounting for 10.19%, 3.97% and 1.6% of the total numbers of family, genera and species in Fanjingshan, respectively including *Rhododendron guizhouense*, *Primula fanjingensis* and *Yushania complanata*, etc. (Photo 2.76-2.79).

Table 2.15 Type plants in the nominated property of Fanjingshan

Phylum	Family	Genus	Species
Bryophyta	2	2	2
Pteridophyta	4	7	8
Gymnospermae	1	2	2
Angiospermae	31	44	52
Total	38	55	64

Photo 2.76 ***Tsuga longibracteata***

Photo 2.77 ***Rhododendron octandrum***

Photo 2.78 ***Berberis xanthoclada***

Photo 2.79 ***Impatiens guizhouensis***

2.a.5.3-8 Vegetation types

The forest coverage rate of Fanjingshan exceeds 90%. Fanjingshan possesses complicated vegetation types, due to the complex and diverse natural environment, and provides a variety of ecological and geographical environments for the growth of different plant populations, with plentiful species whose ecological characteristics are different. There are 5 vegetation type groups, 10 vegetation types and 46 plant formations (Zhou, et al., 1990; Scientific Investigation Editorial Council in Fanjingshan, Guizhou Province, 1987; Editorial Council of Vegetation in China, 1980) (Figure 2.17) (Table 2.16).

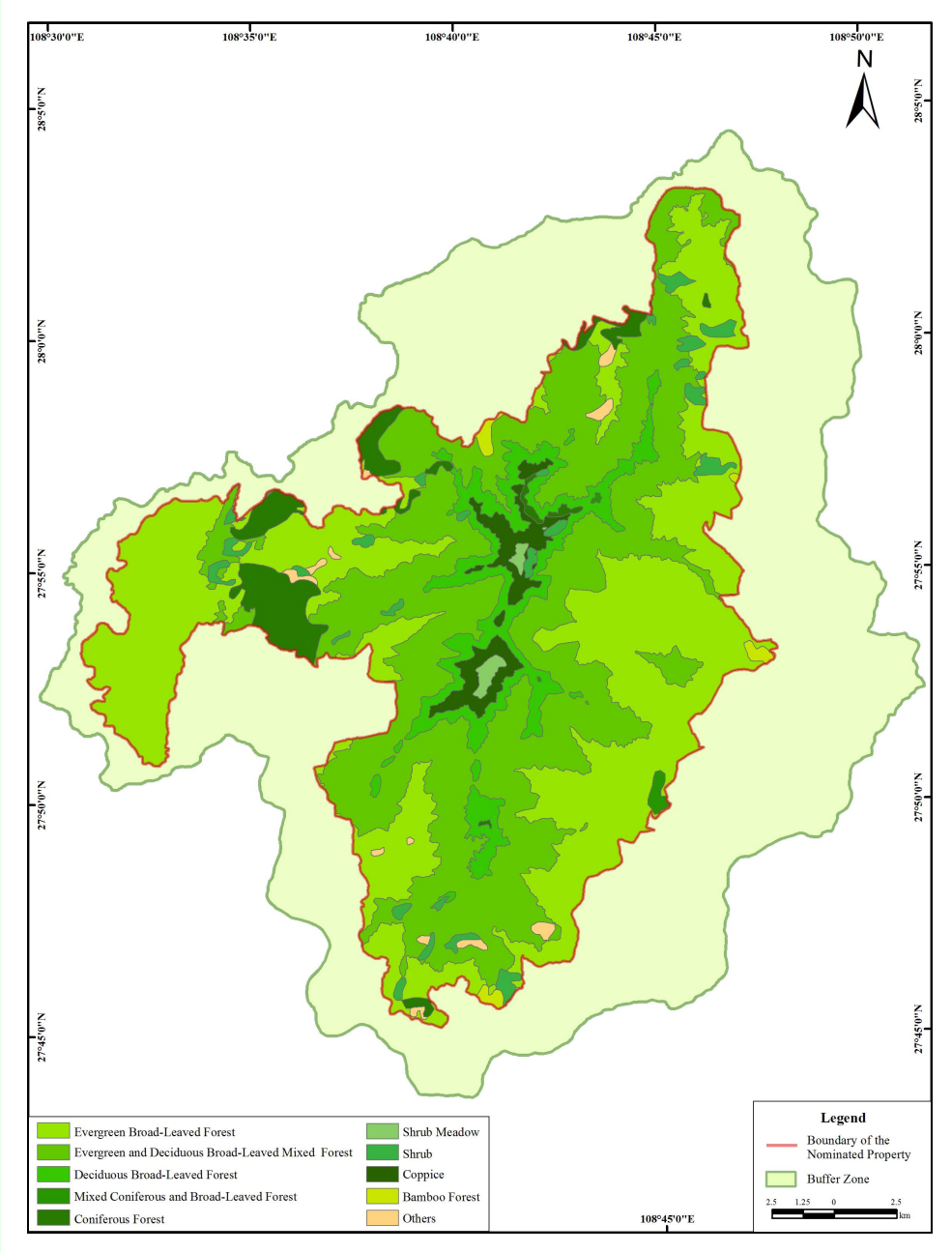


Figure 2.17 The vegetation types in the nominated property

Table 2.16 Major vegetation types in the nominated property

Vegetation Type Group	Vegetation Type	Plant Formation
Coniferous forest	Temperate coniferous forest	(1) Form. *Pinus taiwanensis*
	Temperate coniferous and broad-leaved mixed forest	(2) Form. *Tsuga chinensis*
		(3) Form. *Abies fanjingshanensis —Tsuga chinensis*
	Warm coniferous forest	(4) Form. *Cunninghamia lanceolata*
		(5) Form. *Pinus massoniana*
		(6) Form. *Taxus mairei*
Broad-leaved forest	Deciduous broad-leaved forest	(7) Form. *Pterocarya stenoptera*
		(8) Form. *Alniphyllum fortunei*
		(9) Form. *Liquidambar formosana*
		(10) Form. *Populus adenopoda*
		(11) Form. *Fagus longipetiolata*
	Evergreen and deciduous broad-leaved mixed forest	(12) Form. *Davidia involucrata*
		(13) Form. *Cyclobalanopsis argyrotricha*
		(14) Form. *Juglans cathayensis*
		(15) Form. *Sassafras tzumu*
		(16) Form. *Tetracentron sinense*, *Acer flabellatum*, *Cerasus tomentosa*
		(17) Form. *Lithocarpus* cleistocarpus
		(18) Form. *Weigela japonica*
	Evergreen broad-leaved forests	(19) Form. *Castanopsis fargesii — Engelhardtia*
		(20) Form. *Castanopsis tibetana — Machilus chuanchienensis*
		(21) Form. Castanopsis fargesii — *Machilus chuanchienensis*
		(22) Form. *Castanopsis carlesii — Corylopsis multiflora*
		(23) Form. *Castanopsis carlesii — Rhododendron stamineum*
		(24) Form. *Castanopsis carlesi — Symplocos anomala*
		(25) Form. *Distylium myricoides*, *Machilus ichangensis*, *Lithocarpus hancei*
		(26) Form. *Schima superba*
		(27) Form. *Cinnamomum wilsonii — Cyclobalanopsis lauca*
		(28) Form. *Turpinia affinis*,*Corylopsis sinensis*
		(29) Form. *Rhododendron simsii — Acer sinense*
		(30) Form. *Cerasus tomentosa —Symplocos sumuntia*
		(31) Form. *Acer sinense*
		(32) Form. *Cyclobalanopsis stewardiana*
		(33) Form. *Sassafras tzumu — Rhododendron simsii*
		(34) Form. *Buxus microphylla*
Bamboo grove	Warm bamboo forest	(35) Form. *Phyllostachys edulis*

		(36) Form. *Phyllostachys nigra*
		(37) Form. *Chimonobambusa angustifolia*
		(38) Form. *Sasa longiligulata*
		(39) Form. *Arundinaria fargesii*, *Bambusa vulgaris*, *Indocalamus tessellatus*
Brushwoods and Shrub	Evergreen coniferous shrub	(40) Form. *Juniperus squamata*
	Evergreen leathery leaf shrub	(41) Form. *Rhododendron simsii*
		(42) Form. *Buxus microphylla*
		(43) Form. *Ilex bioritsensis*, *Symplocos lucida*
		(44) Form. *Cotoneaster adpressus*
Swamp and Aquatic vegetation	Swamp	(45) Form. Swamp meadow dominated by *Polytrichum commune*
		(46) Form. *Sphagnum nemoreum*

2.a.5.3-9 Important communities

***Cyclobalanopsis argyrotricha* Community:** *Cyclobalanopsis argyrotricha* is a common evergreen broad-leaved forest or evergreen deciduous broad-leaved mixed forest in Fanjingshan, which is mainly distributed around Huixiangping-Baiyunsi (1,800-2,100 m), Sanwangdian-Niuweihe (1,400-1,700 m) and Jiandaoxia (1,900-2,100 m) on the southern mountain at the altitude of 1,150-2,160 m. Due to the mix with deciduous broad-leaved tree, *Cyclobalanopsis argyrotricha* in Sanwangdian-Niuweihe presents seasonal double peak distribution. The reproduction of *Cyclobalanopsis argyrotricha* in Huixiangping area and Jiandaoxia is often through seedlings and as root suckers; especially with the powerful reproduction method of root sucker, a single dominant community has been formed. *Cyclobalanopsis argyrotricha* is located in the water source area of Macaohe, Heiwanhe, Niuweihe and Xiaojiahe and plays an important role in water conservation and soil fixation in these areas (Photo 2.80).

***Tsuga chinensis* Community:** *Tsuga chinensis* community lies inside the evergreen deciduous broad-leaved forest of Fanjingshan, including *T. chinensis*, *T. longibracteata* and *T. chinensis* var. *tchekiangensi*. *T. longibracteata* grows and scatters as “island” patches at the elevations of 1,000-1,700 m, *T. chinensis* var. *Tchekiangensis* grows and is scattered in forest of *T. chinensis. T. chinensis* widely is distributed widely, mainly at the altitude of 1,700-2,400 m, and is a mixed forest which consists of pure forest, mixed broad-leaved coniferous forest and *Abies fanjingshanensis* (Investigation Editorial Council on Fanjingshan, Guizhou Province, 1986). There are many rare plants in this community, such as *Abies fanjingshanensis, Taxus chinensis, Cephalotaxus sinensis, Tetracentron sinense, Spiraea kweichowensis*, etc. (Photo 2.81).

***Castanopsis* Community:** *Castanopsis* community is the typical evergreen broad-leaved forest and a climax community, with the transitional nature of tropical and temperate forest. It is distributed widely below 1,000 m of Fanjingshan. A variety of *Castanopsis* species are dominant species (Zhou, et al., 1990). Various *Castanopsis* species grow rapidly in forest, with completed structure and complicated community compositions. There are 4 types of *Castanopsis* communities in Fanjingshan, *C. tibetana - Machilus chuanchienensis* community, *C. fargesii - Machilus chuanchienensis* community, *C. carlesii* - c*orylopsis multiflora* community, and *C. carlesii - Rhododendron stamineum* community (Photo 2.82).

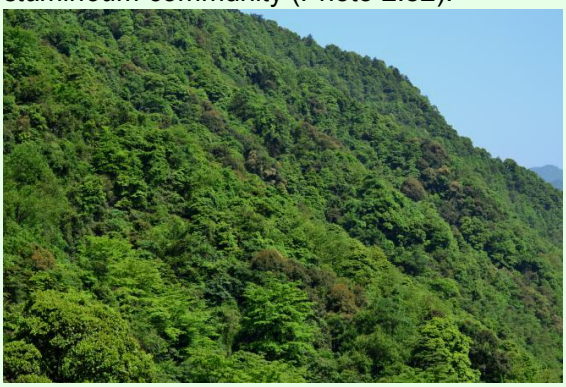


Photo 2.80 *Cyclobalanopsis argyrotricha* community in the nominated property

Photo 2.81 *Tsuga chinensis* community in the nominated property

Photo 2.82 *Castanopsis* community in the nominated property

2.a.5.3-10 Subtropical *Fagus* forest with the most abundant species, the most concentrated distribution and the largest area

Beech (*Fagus* of Fagaceae) is an ancient genus from the Tertiary Period, belonging to Eurasian - North American with discontinuous distribution type, which is now an important component of temperate forest in the Northern Hemisphere (Li, 1996). Based

on fossils and sporo-pollen analysis, *Fagus* may have originated in the late Cretaceous (Zhang, Huang, 1988). In the Tertiary Period, *Fagus* became widely distributed in Northern Hemisphere continents (Li, 1996a; 1996b; Zhou, 1999), because of the influence of the Glacial Period and large topographic changes, *Fagus* became restricted to areas that served as refuge through the Quaternary Glacial Period (Milne, 2006). *Fagus* that once formed contiguous forest has now become fragmented which has important scientific significance for the study of paleo climate change, ancient geography patterns, ancient ecological environments and the characteristics of the ancient plants since the late Cretaceous (Li, 1996) and is also one of the most important communities for continuing research on species evolution and development of vegetation ecological systems (Wang et al., 2012). In the embryonic period of civilization, ancient *Fagus* not only provided humans with edible nuts, firewood and timber, but the ancient Germanic people also engraves runes on the beech wood to spread knowledge and experience, it is perhaps one of the origins of literature (Peters, 1997), which still can be proved by the German writing. The *Fagus* plays an important role in human life and cultural communication.

As early as the Tertiary Period, *Fagus* was widely distributed in the northern part of Eurasia including Siberia and Northeast China - North China - Southwest China, and a large part of North America. In the late Tertiary to early Quaternary, as the global climate became colder, plants from the north had migrated to southern refuges, including some *Fagus* (Zhang and Huang, 1988; Hong and An, 1993; Peters, 1997). After the last glacial, *Fagus* expanded its distribution area rapidly northwards and formed the current distribution pattern.

Currently there are 12 widely recognized species of *Fagus* globally (including 1 variety and 1 subspecies). Western Europe and Central Asia have two species (*F. sylvatica* and *F. orientalis*); eastern North America has 1 species, 1 variety and 1 subspecies (*F. grandifolia*, *F. grandifolia* var. *mexicana* and *F. grandifolia* subsp. *caroliniana*) (Denk, 1999; Alvarez-Aquino, et al., 2004), which are the local climatic climax vegetation. The remaining 7 species are distributed in East Asia (Shen, 1992). There are 3 species distributed in Japan (*F. Crenata*, *F. japonica* and *F. englerianas*), with the first two species endemic to Japan; South Korea has only 1 endemic species (*F. multinervis*) (Tomoshi et al., 2006; Tukasa Hukusima, et al., 2013); China, with the 4 species of *Fagus* distributed in subtropical mountains (Zhang and Huang, 1988; Wu, 1997; Peters, 1997), has the most species in the world, and has become one of most abundant areas of *Fagus* species. The East Asian *Fagus* forests, including subtropical *Fagus* forests in China and

temperate *Fagus* forests in Japan, have become the key vegetation type between evergreen broad-leaved forests and evergreen coniferous forest in East Asia (Tukasa Hukusima, et al., 2013).

Subtropical *Fagus* forests are mainly distributed in the mountains of South China, the Sierra Madre Oriental of Mexico, the mountains of Florida and Texas in North America (Surhone, 2010). In China, *Fagus* is only distributed in some south subtropical mountains above 1,000 m, while the typical temperate zone of north Qinling Mountains as well as the very suitable habitats like Bohai Gulf has no *Fagus* (Cao et al., 1995). Therefore, species composition and community characteristics of subtropical *Fagus* forests in China have obvious regional characteristics.

Fossils of *Fagus* from Tertiary to Oligocene Strata found in Nanhai of Guangdong (Li, 1996), Tengchong of Yunnan (Li, Yang, 1984), Dunhua of Jilin (Tao, Du, 1982), etc. showed that *Fagus* had been widely distributed in the southeast of Tibet, northeast of Yunnan, north of Nanling Mountains in China (Li, 1996). The result indicates that *Fagus* existed in Fanjingshan as early as the Tertiary Period.

Fagus forest is the most typical forest type, which has the strongest control on ecosystem in Fanjingshan with abundant species, strong original nature, concentrated distribution, large area, and it has crosses evergreen broad-leaved forest, evergreen and deciduous broad-leaved mixed forest and deciduous broad-leaved forest (Figure 2.18). Continuous distribution area of *Fagus* is about 15,646 ha at an altitude between 946 m to 2,088 m, and from low to high altitude one finds distributions of *Fagus* longipetiolata, *Fagus* lucida and *Fagus engleriana* and sometimes mixed species of *Fagus* genus. The area of *Fagus* forests in Fanjingshan is greater than the area in Micangshan (7,064.8 ha), which was known as the biggest area in China (Chen, 2014), and is greater than the area in Sierra Madre Oriental (only 2-40 ha per distribution area) in Mexico (Williams et al., 2003), which was known as the largest area and the most continuous *Fagus* forest all over the world.

According to the areal-patterns and errata of seed plants in China from Wu (1991; 1993), there are 12 areal-patterns including 92 genera of woody plants of *Fagus* community in Fanjingshan (Table 2.17). Although the tropical elements (areal-pattern 2-7) and the north temperate elements (areal-pattern 8-10) are both contain 36 genera of woody plants of the community, but the number of species of the tropical genera (85 species) is more than the number of species of the temperate genera (66 species). The woody plants of the community can be classified into three types: tree, shrub/small tree and woody climber (Table 2.18), and the evergreen composition accounts for 63.16%, 79.49% and 54.17% of each type of the three types. According to the analysis from the

all 178 woody plant species, there are 123 evergreen species accounting for 69.10% of the whole woody plant species. The above evidences suggest that the *Fagus* forest in Fanjingshan has an abundant composition of species that not only contains large quantities of tropical and subtropical genera, also contains some temperate genera; the woody plants of the community have a tight connection with the tropical flora as well as temperate flora and have strong character transiting from tropical to temperate, and woody plants are dominated by evergreen species, so the *Fagus* community here has obvious subtropical nature.

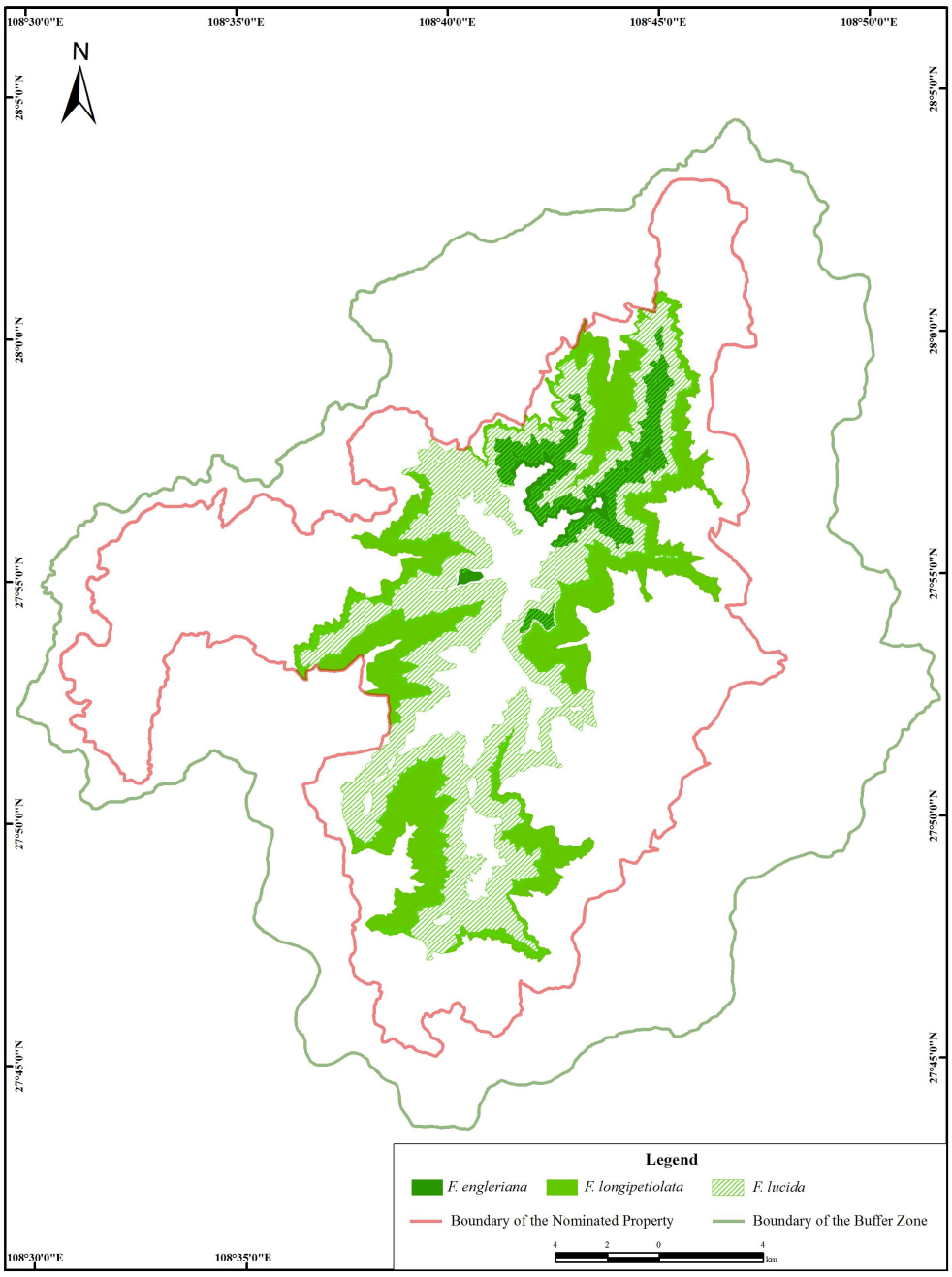


Figure 2.18 Distributions of *Fagus* in Fanjingshan

Table 2.17 Phytogeographical components of woody plants of *Fagus* community in the nominated property

Areal-patterns	Genus Number	Percentage /%	Floristic Elements	Genus Number	Percentage /%
1 Widespread	1	1.08	Cosmopolitans	1	1.08
2 Pantropic	13	14.13	Tropic element	36	39.13
3 East Asia (Tropical & Subtropical) and Tropical South America disjuncted	5	5.43			
4 Old World Tropics	3	3.26			
5 Tropical Asia to Tropical Australasia Oceania	1	1.08			
6 Tropical Asia to Tropical Africa	2	2.17			
7 Tropical Southeast Asia to Indo-Malaya and Tropical Southwest Pacific Islands	12	13.04			
8 North Temperate	20	21.74	North temperate element	36	39.13
9 East Asia & North America disjuncted	15	16.30			
10 Old World Temperate	1	1.08			
14 East Asia	12	13.04	East Asia element	19	20.65
15 Endemic to China	7	7.61			
Total	92	100	Total	92	100

Table 2.18 Attribute property of woody plants of *Fagus* community in the nominated property

Attribute Property	Tree		Shrub/Small Tree		Woody Climber		Total	
	Speci-es	Percentage /%	Speci-es	Percentage /%	Speci-es	Percentage /%	Speci-es	Percentage /%
Evergreen composition	48	63.16	62	79.49	13	54.17	123	69.10
Deciduous composition	28	36.84	16	20.51	11	45.83	55	30.90
Total	76	100	78	100	24	100	178	100

The *Fagus* community in Fanjingshan is characterized by stable synusia, obvious hierarchical structure, well differentiated tree stratum and shrub stratum. The tree stratum is often differentiated into two or three sub-layers and the seasonal change of the community is showed as bimodal distribution. The upper tree stratum mainly consists of the species of deciduous broad-leaved forest like *Fagus*, *Acer sinense*, *Cercidiphyllum japonicum* and *Prunus serrulata*, etc. and the color of physiognomy of the community is sap green. The dominant species in the forest understory are mainly evergreen plants

including *Castanopsis chunii*, *Lithocarpus grandifolius*, *Illicium simonsii*, *Illicium ternstroemioides*, *Schisandra chinensis* and *Kadsura longipedunculata*, etc. In October each year, the leaves of first sub-layer of *Fagus* community turn yellow and fall off and the evergreen broad-leaved forest of second sub-layer is exposed, so the physiognomy of the community forms bimodal distribution with the pattern of two blooms and one gloom (Photo 2.83).

Photo 2.83 Bimodal distribution phenomenon of *Fagus lucida* forests in the nominated property of Fanjingshan

The *Fagus* community in Fanjingshan has strong original nature. Diameter at breast height (DBH) of the largest *Fagus* in the community is about 1.5 m, whose age is about 730 years old at least according to estimation method of Yang and Sun (1990). As part of the basal groups of angiosperms, the ancient companion species of *Fagus* forest, such as *Illicium simonsii*, Magnoliaceae, Lauraceae, Ericaceae and Theaceae, are part of the oldest origins of angiosperms (Lu et al., 2005). This fully demonstrates that the plant communities of Fanjingshan are ancient and original.

Jan (1975) researched 3 *Fagus* species in 4 different slopes between the vertical band position in the community and the relationship between water and heat conditions. It turns out that the hydrothermal conditions of *Fagus* distributed in different slope and vertical height in Fanjingshan is consistent with its hydrothermal conditions varieties in the latitudinal distribution of inland China. Fanjingshan intensively and significantly

performed the change of *Fagus* plants due to adapting to the change of climate by the slope gradient type and performed the growth condition in a gradient way with the adaptation range of various kinds of *Fagus* and the range of suitability, and the changes in the vertical span of Fagus forest at an altitude of 1,200 m in Fanjingshan has embodied the changes along latitudes within 10 degrees in East Asian continent (Xichou County, Yunnan (N23°06′) - Funiushan Mountain, Henan (N33°25′) (Li, 2008) adequately.

The *Fagus longipetiolata* community (Photo 2.84a) has a distribution area of about 6,734 ha at an altitude between 946 m to 1,542 m. According to the distribution of canopy height, the tree layer can be divided into 3 sub layers, the height of the first sub layer is about 20-30 m, the height of the second sub layer is about 9-19 m, and the height of the third layer is about 2-8 m; in the second and the third layers, evergreen plants are the dominate species. In the evergreen broad-leaved forest of the southwest slope, the coverage of *Fagus longipetiolata* is about 20%, the community displays subtropical properties. Compared to the southern slope, the northwest slope has more *Fagus longipetiolata* and it is the dominant species of the community with coverage of about 30%, and the community belongs to mixed subtropical and temperate vegetation. As the canopy of the tree stratum dominated by *Fagus longipetiolata* is relatively sparse, it can't shade all the habitats so it provides enough space for the growth of shrubs and herbaceous plants and shady environment for ombrophyte. In addition, the tall limbs of *Fagus longipetiolata* also support the growth of vines (e.g. *Actinidia fanjingshanensis*), phytoparasites and paraphyton (e.g. *Dendrobium fanjingshanense*), etc. The shells of *Fagus longipetiolata* are relatively large, plump and well fructifying that provide food for many wildlife especially rodents.

The distribution area of the *Fagus lucida* community (Photo 2.84b) in Fanjingshan is about 9,875 ha, at the elevation of 1,221-2,088 m and it has obvious tree layers. According to the distribution of canopy height, the community can be divided into 3 sub layers: the height of the first sub layer is about 20-30 m; the height of the second sub layer is about 9-19 m; and the height of the third layer is about 2-8 m. In the second and the third layer evergreen species are the dominant species - the deciduous species and evergreen trees are comparable in quantity - deciduous species are the dominant species from low altitude to high altitude. In the evergreen broad-leaved forest of the southwest slope, the coverage of *Fagus lucida* is about 60% - 70%. More individuals of *Fagus lucida* occur on the northwest slope and it is the dominant species of the community with coverage of about 40% - 65%. The competition between subtropical

plants and temperate plants is obvious, and the temperate plants are dominant. Saplings of *Fagus lucida* grow well in Yinjiang - Jinding and Yangaoping - Jinding, slowly establishing in the pure forest. *Fagus lucida* has the largest distribution area in Fanjingshan, and except in the west, it is distributed along the Jinding radially to the nine major mountain ranges with large community coverage. *Fagus lucida* can be divided into 4 types of forest: *Fagus lucida - Fargesia spathacea* Forest, *Fagus lucida - Illicium ternstroemioides* forest, *Fagus lucida - Illicium ternstroemioides* forest and *Fagus lucida - Castanopsis chunii* forest.

The distribution area of *Fagus engleriana* (Photo 2.84c) is 1,611 ha, at an altitude of 1,718-2,088 m. It is only distributed in the northeast Xiaojiahe slope of Fanjingshan as a forest and also in Yanziqian, etc. in fragmentation pattern. The community structure is obvious, and can be divided into two sub layers: the first sub layer is 9-30 m and the second layer is 2-8 m. Phanerophytes plants account for the highest proportion in the community, followed by hemicryptophyte, geophytes, annuals bud and chamaephytes. Deciduous broad-leaved tree species have the absolute advantage, belonging to the cold temperate deciduous broad-leaved forest; the seedling development is influenced by deciduous trees, such as *Cerasus tomentosa*.

a. *Fagus longipetiolata*

b. *Fagus lucida*

c. *Fagus engleriana*

Photo 2.84 *Fagus* Community

As a key refuge and the most ideal habitat of *Fagus*, Fanjingshan has a large distribution area of *Fagus* forest with rich species, complex community composition and stable community structure with strong aboriginality, and it is currently known to be the largest and most concentrated subtropical *Fagus* forest. By adapting to the different altitudes of Fanjingshan, *Fagus* forest here has embodied the changes of subtropical *Fagus* forests along latitudes within 10 degrees in the East Asian continent.

2.a.5.4 Animal diversity

2.a.5.4-1 Fauna

According to Zhang's view (2010), Fanjingshan belongs to the Oriental realm under the principle biogeography. It belongs to the central region of China and the Western mountain plateau sub-region (Zhang, 2011) (Figure 2.19).

Figure 2.19 Location of the nominated property of Fanjingshan according to zoogeographic classification system (Zhang, 2011)

The terrestrial vertebrates of Fanjingshan have 12 distribution zone types (Table 2.19). The dominant types are Oriental realm and South China region, which account for 60.58% of the total species number, followed by the Palae-arctic realm species, which account for 10.95% of the total species number. The remaining 28.47% belong to the other distribution zone types. Amphibians and reptiles mainly belong to the South China Type and possess related local animal fauna. However, there are some oriental realm reptile species. Birds come from a wide range of zoographical zones, including the Oriental realm, Palae-arctic realm, south China and northeastern China types. Mammals come from all zoographical types except the northeastern China type. These facts testify to the ancient origins and high diversity of the fauna.

Table 2.19 The distribution types of terrestrial vertebrates in the nominated property

Distribution Type	Amphibian	Reptiles	Birds	Mammalia	Total	Percentage /%
C-Holarctic Realm	-	-	9	2	11	3.09
E-Monsoon regime	4	4	3	3	14	3.84
H-Himalaya-Hengduan mountain type	5	2	15	3	25	6.67
M-Northeast type (Northeast China or near the region)	-	-	24	-	24	6.4
O-Not easily categorized, widely distributed	-	-	20	5	25	6.67
P-Plateau type	-	-	-	1	1	0.2
S-South China type	16	25	28	22	91	24.58
U- Palae-arctic type	-	-	33	8	41	10.95
W- Oriental type	9	9	84	33	135	36
K-Northeast type (Eastern based)	-	-	1	-	1	0.2
Y-Yunnan-Guizhou Plateau	4	1	-	-	5	1
X-Northeast-North China type	-	-	2	-	2	0.4
Total	38	41	219	77	375	100

- Data missing.

2.a.5.4-2 Animal species

The number of recorded animal species found within the nominated property (not counting domestic animals) totals 2,767. This includes 450 species of the vertebrates in 32 orders, 100 families and 281 genera, 2,076 species belong to insects (probably far from totally documented), 215 species belong to Arachnida and 26 species belong to Oligochaeta (Table 2.20).

Table 2.20 Wild animal species in the nominated property

Class	Order	Family	Genus	Species	Percentage /%
Mammalia	8	24	57	80	2.89
Birds	16	48	129	224	8.10
Reptiles	2	10	28	43	1.55
Amphibian	2	8	23	43	1.55
Fish	4	10	44	60	2.17
Insecta	19	208	1,105	2,076	75.03
Arachnida	3	52	110	215	7.77
Oligochaeta	1	2	4	26	0.94
Total	55	362	1,500	2,767	100

Vertebrates

Mammals

There are 80 species, 57 genera of 24 families recorded mammals living in the nominated property. The richness of mammals relates to the vertical zonal distribution. It can be divided as the piedmont farming area, evergreen broad-leaf forest zone, evergreen deciduous mixed forest zone and sub-mountain coniferous forest zone, and shrub-meadow zone. Some large mammal species live in this habitat at present, such as: *Panthera pardus*, *Neofelis nebulosa*, *Ursus thibetanus*, *Capricornis milneedwadsii*, *Moschus berezovskii,* all are listed in the National Protected Animals List. Most significantly the property is the only natural habitat of the endangered Guizhou Snub-nosed monkey *Rhinopithecus brelichi*.

Birds

In the incomplete surveys, 224 species have been recorded (MacKinnon estimates the total richness may be closer to 300), 129 genera, and 48 families of birds living in the nominated property, including 32 endangered species. The Avian zoogeography belongs to subtropical forest (No.140) and southeastern mountain area (No.141) of the mainland in China. There are 4 critically endangered or endangered Phasianidae species distribute in this area: *Syrmaticus ellioti* (South China type (tropical - warm temperate zone)), *Syrmaticus reevesii* (South China type (south subtropical - middle subtropical zone)), *Chrysolophus pictus* (Oriental type (middle subtropical - north subtropical zone)) and *Tragopan temminckii* (Himalayan-Hengduan mountain type (Hengduan mountain region)). This diversity indicates important characteristic of the avian species dispersal. The nominated area is also located in the migratory pathway of many raptors and passerines. The area contains 100 species of migratory birds; the ratio is 44.64% of the total bird species that live in the nominated area. This includes 46 species of summer resident birds, 30 species of winter resident birds and 24 species of passing migrant birds for which Fanjingshan provides important habitat.

Reptiles

The records on reptile species document 43 species, 28 genera, and 10 families in the nominated area. Most species belong to Oriental realm, and typical species of central China and south China. Snakes account for most of the reptile composition, the ratio is 79%, and the Colubridae has the most species consistent with the reptile species composition in Guizhou Province and China. The second largest family is Crotalidae, which shows the adaptive relationship is between the species and the environment.

Amphibians

There are at least 43 species 23 genera and 8 families of amphibians recorded in the nominated property. Most of these species belong to central China and south China types, a few species belong to southwestern China type. It boasts the critically endangered giant salamander *Andrias davidianus*, (which has the largest body size of all salamanders). It also preserves the endemic species *Vibrissaphora boringiae*, the population of this species has declined dramatically and is on the brink of extinction. The original distribution area of this species includes Mount Emei. Fanjingshan also has the endemic amphibian subspecies *Xenophrys binlingensis* subsp. *fanjingmontis*.

Fish

Basic surveys have documented 60 species of 44 genera of 10 families of fishes living in the rivers of the nominated property. The main species compositions are of the Cypriniformes and Perciformes, which together account for 90% of the total species numbers of the nominated property. The traits of the drainage in Fanjingshan have a narrow surface area, low volume, high falling height, rapid flow, and some dangerous shoals. Smaller fish species like to live in the rapids or caves, which indicates their adaptation to the geographical and drainage environments (Zheng, 1990). The high diversity is due in part to the fact that streams radiate from the nominated site in all directions and form the upper reaches of several different river catchments of the bio-rich Yangtze River basin.

Invertebrates

Basic surveys have documented 2,317 species 1,219 genera 262 families and 23 orders at the present time, including 2,706 species of Insecta and 215 species of Arachnida. There are 26 species of Oligochaeta that include 5 new genera, 115 new species, 245 endemic species, 47 rare and endangered species, 1 new recorded genus in China and 30 new record species records in China. More intense survey would probably add many more species to these numbers.

According to the fauna in China, the typical Insecta species belong to the central China fauna, and show a correlated relationship with the southwestern China, South China, North China, northeastern China, Tibetan area and Inner Mongolia-Xinjiang region in that order. It suggests that there is a species radiation relationship among the four fauna types of Central China, Southwestern China, South China and North China, because of the rich endemic or original taxa. It can be presumed that the site acts as a radiation and divergence center for Chinese insects, because the landscape is connected with the neighboring areas.

2.a.5.4-3 Endemic animals

The nominated property of Fanjingshan is a very important habitat for the wild animals, species evolution and the understanding of phylogenetic. There are an extraordinary 249 endemic animal species in the relatively compact of Fanjingshan (Table 2.21), including *Rhinopithecus brelichi*, *Muntiacus reevesi jiangkouensis* subsp. nov., *Megophrys binlingensis* subsp. *Fanjingmontis*, *Lamelligomphus tutulus*, *Aporia largeteaui* subsp. *fanjinensis*, and *Carabus fanjingsensis*.

Table 2.21 Endemic wild animals in the nominated property

Class	Total Species Number	Number of Endemic Species	Percentage/%
Mammalia	80	3	1.20
Amphibia	43	1	0.40
Insecta	2,109	238	95.58
Arachnida	215	5	2.01
Oligochaeta	26	2	0.81
Total	2,473	249	100

Rhinopithecus brelichi

Diagnosis characteristic and conservation status

Guizhou snub-nosed monkey *Rhinopithecus brelichi* (genus: *Rhinopithecus*, subfamily: Colobinae, family: Cercopithecidae, order: Primates) (Photo 2.85), which the body length is 637-690 mm, the tail length is 846-905 mm, the face color is gray-white or light blue, the nasal brow also looks light blue, the snout is a little concave, the color of the hair base at the front of their head is golden yellow, but becomes a gray white color along with the extent toward to back; the whole body looks a gray color, but there is an obvious white spot between the shoulders, and the length of hair on the shoulders can be up to 160 mm, this can be recognized with other golden monkeys species. The color of hair under the neck, axilla, and the inner of fore limbs is golden yellow. The hair color of the tail base is deep gray, and becomes a black or black-white color at the tip of the tail. *Rhinopithecus brelichi* is the endemic primate species in Fanjingshan. It has the smallest population and the smallest habitat area among the all *Rhinopithecus* species. It was evaluated as being endangered by the IUCN Red List, and is an Appendix I species listed by CITES. It is also listed at the national level in China as a Class I protected wild animals.

The historical distribution

According to fossils records, *Rhinopithecus* species had a wide distribution area in China historically, such as Guizhou, Hunan, Sichuan and Guangxi provinces, the most easterly

distribution was to Xin'an, Henan province and Jinhua, Zhejiang province, the whole distribution area also included the south of Qinling Mountains - Huaihe, and the east of Tibet plateau (Quan, 2002), but now, the distribution area is fragmented and isolated (Figure 2.20).

Photo 2.85 *Rhinopithecus brelichi*

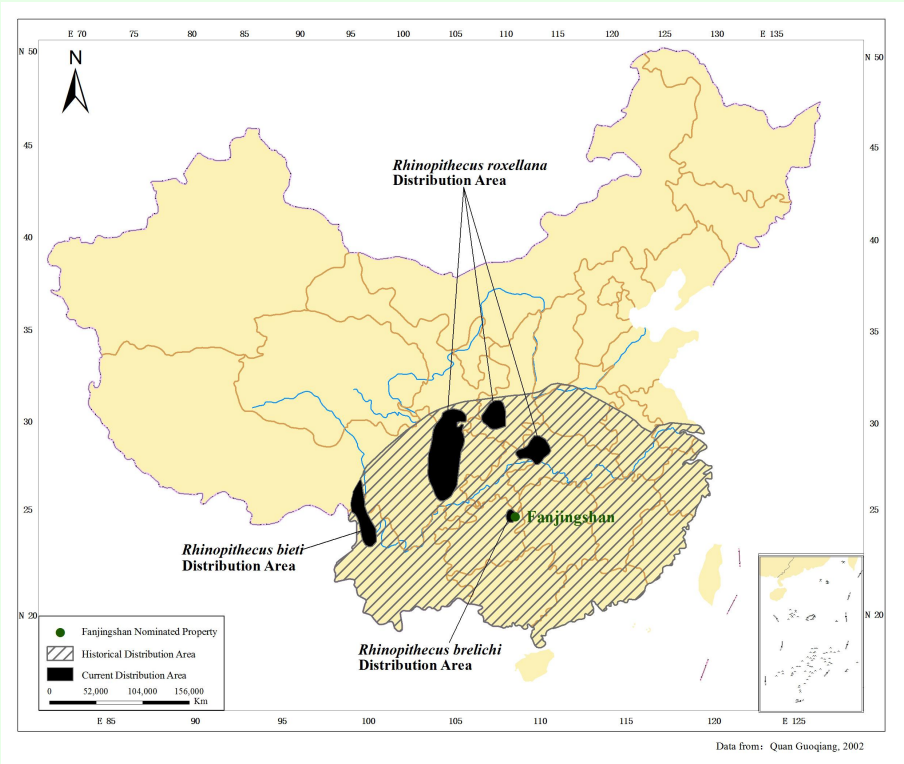


Figure 2.20 Historical distributions of *Rhinopithecus* in China

Population estimates

Early estimates of the population of Guizhou snub-nosed monkeys are little more than educated guesses (Quan 1980, 81). The first accurate estimation was made in 1993, by Yang et al. reported the population size was 764 individuals (credibility probability: 95%, the confidence level: 655-873 individuals). And the sampling survey work continued in 2001 showed that the result was 777 individuals (the confidence level: 668-886 individuals, Yang et al., 2002), the latest surveys reported that the population size was 750 (Xiang et al.,2009) and 761 (Guo,2017). According to the infrared monitoring of Fanjingshan nature reserve in recent years, the number of *Rhinopithecus brelichi* group remains at about 750.

Population structure and home range

Based on 6 years of surveys, we now know the population structure of *Rhinopithecus brelichi* is complex due to frequent group fusion and fission. The ratio of adult males to adult females is about 1-3 and the proportion of females with infants is about 30%. The basic units of population are small group c. 25 animals each which often congregate together into huge troops. This is very similar to *R. roxellana* and *R. bieti*. (Yang, 2002)

The whole population can be divided into 4 major groups that have relatively regular home ranges and forage routes. Home range areas are respectively 92 km^2 (Dongpengshan group, 150 individuals), 110 km^2 (Mimashu group, 50 individuals), 56 km^2 (Huixiangping group, >100 individuals), and 77 km^2 (Yangaoping group, >450 individuals), cited from Yang and Xiang (2002, 2009).

The active elevation range of *Rhinopithecus brelichi* is from 1,300-2,000 m, the vegetation type is evergreen deciduous broad-leaved mixed forest belongings to north temperature zone, for example, Maple, Cherry, Beech, Birch, *Sorbus and Azalea*. As people seldom go there, and there are many rich tree species, and complicated vegetation types, all provide an ideal habitat for *Rhinopithecus brelichi*. This species has preferences for different habitats within the nominated property. The groups always use the northeastern and central part of the core area, seldom use the northwestern area, and they only use the southwestern and buffer zone occasionally.

They forage in the evergreen broad leaf forest at the edge of habitat in winter. The activity pattern relates to the seasonal diet change, and reproduction activity that has adapted to the environmental conditions.

Diet composition

It has recorded the diet composition of *Rhinopithecus brelichi*, includes 116 species. This is composed of 105 woody plant species, belonged to 44 genera 29 families. Most of the

Rosaceae, followed Caprifoliaceae, Aquifoliaceae, Ericaceae, Fagaceae. Excluding plants species, the *Rhinopithecus brelichi* diet consisted of insects (6 species), Fungus (2 species), Lichen (1 species) bird eggs and soil. In spring its diet consisted of young leaf and unripe fruit and seeds. In summer, its diet is leaf, fruit and seeds. In autumn its diet is consisted of matured leaf and the buds, and some bark in winter.

According to Yang's study (2002), the *Rhinopithecus brelichi* feeds on all species of *Euonymus*, *Cerasus*, *Padus*, *Acer*, and *Yulanlia*, and favorite the *Fagus* species (Yang, 2002). The *Rhinopithecus brelichi* feed on 44 species in the *Fagus lucida* and *F. longipetiolata* forest, the occupation ratio was 41.90% among all diet species, and also feed on the under-forest deciduous plants. It suggested that the diet composition of *Rhinopithecus brelichi* was closely related with *Fagus* forest. This is a much wider range of food types than recorded for the higher altitude *R. roxellana* or *R. bieti* which mostly subsist on lichens.

Habitat preference

The habitat provides many needs for the animals, such as: food, temperature, humidity, hiding places and reproduction place etc. The dominant environmental factors are food and temperature, which influence the home range. Firstly, because the main food species are the plants, of which known that there are 105 species woody plants eaten by *Rhinopithecus brelichi*, so they clearly like to select the more species rich forest types, for example, the evergreen deciduous broad leaf mixed forest. Secondly, *Rhinopithecus brelichi* like warmer conditions and avoid the cold, the annual average temperature is 5-13℃ in the habitat, and the humidity demand is the same as the temperature. *Rhinopithecus brelichi*, is a timid, inoffensive primate species, when they encounter and face their enemies in nature, they always move to escape. They are especially scared of human beings. They always select the primary forest as their habitat, because there is less human activity. Finally, *Rhinopithecus brelichi* mate in September-October and deliver their young in April, so they select a place as their habitat that complicated topography, with a large distance from resident locations. Because of the special geographic location of Fanjingshan National Nature Reserve, it is rich in trees species, due to superior hydrothermal condition and the obvious seasonal canopy aspects. The nominated property provides for all the survival needs of *Rhinopithecus brelichi*. The limited activity area was about 340 km^2, and the elevation was 1,000-2,200 m, the dominant vegetation type was evergreen deciduous broad-leaved mixed forest between 1,300-2,000 m, the main habitat is 260 km^2. There are 18 vegetation types distributed in the whole habitat, but the optimal habitat lies at 1,500-1,700 m(Photo 2.86).

Rhinopithecus brelichi prefer to select the *Fagus* forest, because not only do the higher trees give great viability, they are rich in trees resource with its dense canopy. This forest

type provides a wealth of foraging places and hiding places for *Rhinopithecus brelichi*, and the big branches are also convenient for the activities of *Rhinopithecus brelichi* .

Population Viability Analysis

Cooperation launched in October 25-29, 1999, between the IUCN Species Survival Commission Captive Breeding Specialist Group (SSC CBSG and BESO British) and Fanjingshan National Nature Reserve, focused on the survey data collection from 1995-2001, and used the Vortex 8.03 Model to analysis the population viability of *Rhinopithecus brelichi*. The evaluation result as follows:

An important PHVA Workshop on *Rhinopithecus brelichi* (IUCN 1999) supervised by IUCN's SSC CBSG made the following conclusions and recommendations. Population at that time was estimated to be 750-800 individuals. Vortex analysis indicated the population to be large enough to avoid inbreeding depression but the figure of 200 animals was identified as a danger point below which probability of extinction would rise sharply. Primary threats were identified as various forms of conflict arising from human activities in and around the reserves; the effects of tourism and a perceived shortage of reserve staff. General recommendations included the reduction of those threats, improving the protection status of some areas of species habitat and reintroduction into a new area. It was recommended to freeze tourism numbers to the level at that time. Captive breeding was considered justifiable in order to establish a captive colony of about 20 animals to serve as a source of new animals for introduction into a new natural site. The workshop developed a captive population studbook and stressed the need to update to guide a healthy breeding plan. The workshop also identified a number of ways in which the breeding facility should be improved. Most of these recommendations have been ignored by subsequent management of the captive breeding facility.

Xiang et al (2009) surveyed five sites in Fanjingshan areas between August 2007 and June 2008. These sites were identified from previous surveys and interviews with local officials and villagers. Four sub-populations, with a total of ca. 750 individuals, were located in mixed deciduous and evergreen broad leaf forest at 800–2,200 m. Identified threats to the species include (1) accidentally injured or killed by poaching, (2) loss or alteration of habitat through wood extraction, and (3) loss or alteration of habitat through economic activities, such as building projects and illegal mining. We recommend that several actions can be taken to alleviate the anthropogenic pressure on the ecosystem including: (1) designating specific forest reserve for sustainable wood extraction, (2) utilizing biogas to reduce firewood demands, (3) introducing local people to bamboo utilization for generate greater cash income, (4) educating for young people and

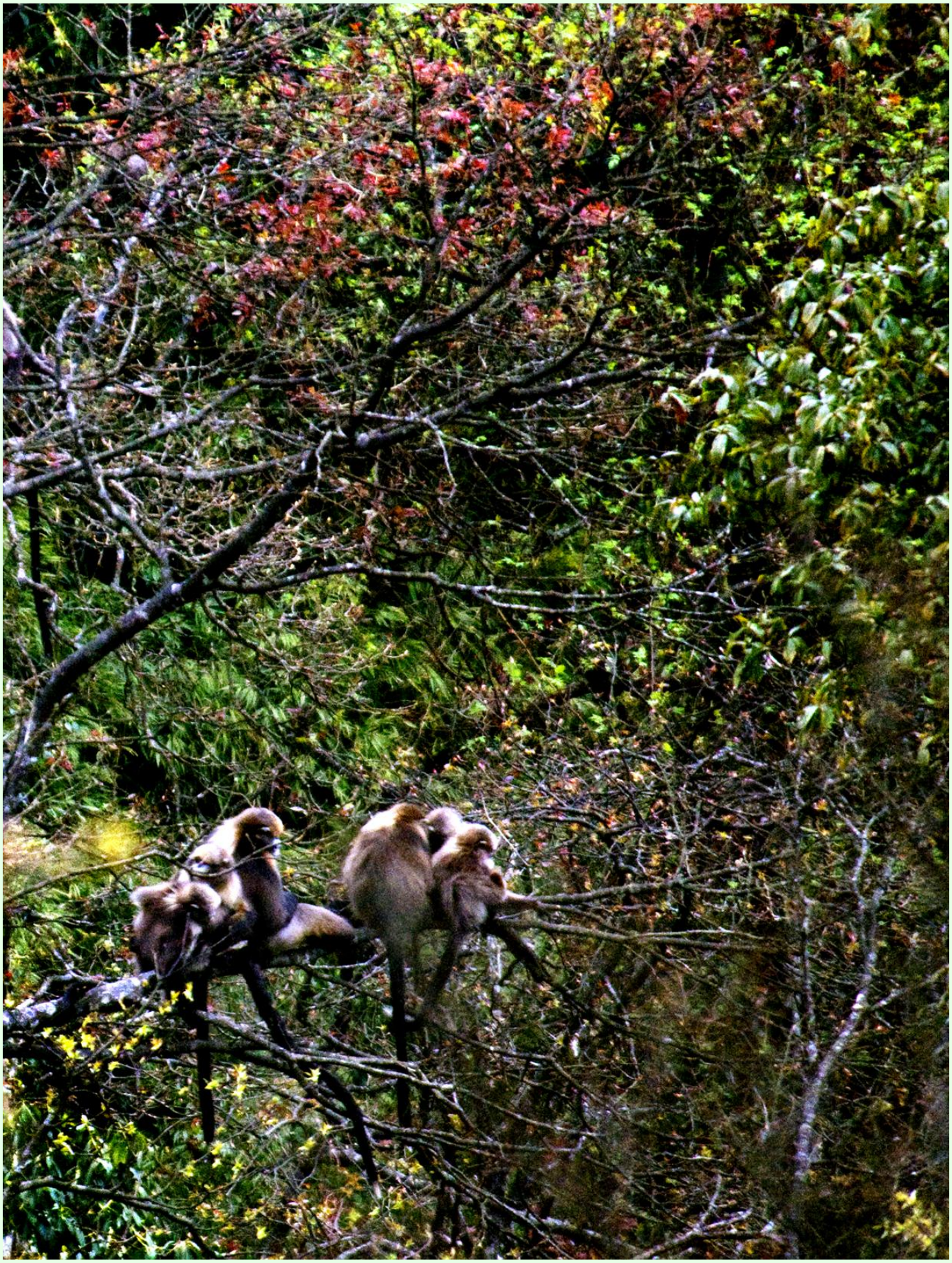


Photo 2.86 Evergreen and deciduous broad-leaved mixed forest habitats for *Rhinopithecus brelichi* population viability analysis

encouraging them to work in developed areas, and (5) encouraging the villagers to move out the mountain.

An analyses of mtDNA drawn from 146 DNA samples collected in Fanjingshan in 2007 and 2008 (Kolleck et al. 2013) indicate that although the BSP suggests a stable female effective population size (Nef) in *R. brelichi* over at least 25,000 to 35,000 years, a strong decline is indicated 3,500 to 4,000 years ago. A similar population trend was found in *R. bieti* and *R. roxellana*. According to geographic provenances of fossils and historical records, all snub-nosed monkey species in China were once widespread. Simultaneously with the decline of Nef in the three Chinese snub-nosed monkeys, the human population increased and with it, significant modifications of the environment due to agricultural practices started, thus largely reducing suitable habitat for snub-nosed monkeys in China.

The high genetic diversity of nDNA and lack of evidence for a recent bottleneck strongly suggests that the *R. brelichi* population was in equilibrium during its recent history.

These results suggest that the overall genetic diversity of the endangered *R. brelichi* is not reduced to a degree that it might become a direct threat for the long-term survival of the species. In contrast, due to the very limited distribution and population size of *R. brelichi*, conservation strategies should be focused on direct threats to this species (such as tourist infrastructure development, deforestation, grazing of livestock, using the reserve as source for food and fire wood) and try to remove or limit them. An enlargement of the reserve would be advantageous, but it seems even more important to establish at least one additional, but geographically isolated population. A translocation of some individuals into another habitat might minimize the risk that a stochastic event like a forest fire or a disease could lead to extinction of the species. There could be several sites within Wuling Ridges that might offer such habitats, but thorough surveys and habitat suitability analysis are required to find them.

There is the large area primary forest located in the northeastern of Fanjingshan National Nature Reserve that is suitable for the *Rhinopithecus brelichi*. It is necessary to limit human activity, and allow ecological corridors to re-establish, enlarging the habitat area, in order to protect the surviving population and restore of *Rhinopithecus brelichi*.

***Muntiacus reevesi jiangkouensis* subsp. nov**

The *Muntiacus reevesi jiangkouensis* subsp. nov, looks like the nominative subspecies based on morphology, body size and the orbital gland shape. However, they have a longer earlap, a narrower face, with a longer front gland which appears in a “V” shape. This subspecies emerge in the shrub forest of the low mountain, hilly or the farmland at

the edge of forest. It is a typical nocturnal mammal species, and more active at the sunset and early morning when they frequently travel to nearby habitats feed on the grass, young leaves and branches. They more often are found in the grass meadow at the edge of farmland, eat grass, young leaves and shoots of wheat, pea and peanut (Gu, 1998, Photo 2.87).

Photo2.87 *Muntiacus reevesi jiangkouensis* subsp. nov.

2.a.5.4-4 Rare and endangered animals

Currently, there are 115 species of rare and endangered animals in Fanjingshan, including 38 animal species on IUCN Red List, 45 species on CITES, 87 species on China species Red List and 44 species listed as National Key Protected Wild Animal species in China (Table 2.22).

Fanjingshan is a unique habitat for *Rhinopithecus brelichi* and a key habitat for a variety of rare and endangered large mammals, such as *Macaca thibetana*, *Macaca mulatta*, *Manis pentadactyla*, *Ursus thibetanus*, *Panthera pardus*, *Neofelis nebulosa*, *Viverra zibetha*, *Moschus berezovskii*, *Capricornis milneedwadsii* and *Elaphodus cephalophus*. Fanjingshan is one of China's important bird areas (A1: globally threatened species, A2: restricted range species, A3: biome limiting species) (Chen, 2009). The rare and endangered birds include *Syrmaticus ellioti*, *Syrmaticus reevesii*, *Tragopan temminc*kii and *Aix galericulata*. In addition, Fanjingshan is also a precious habitat for a variety of rare and endangered amphibians, reptiles, fish and insect species.

Table 2.22 Rare and endangered animals in the nominated property of Fanjingshan

Class	IUCN Red List(2016)				CITES Appendix (2013)			National Key Protected Wild Animals (2004)		China Red List (2004)			
	CR	EN	VU	NT	I	II	III	I	II	CR	EN	VU	NT
Mammalia	1	3	7	4	7	9	6	4	13	1	8	21	16
Birds		1	1	2	1	18		1	25			1	9
Reptilia		2	1		1	2					2	10	
Amphibian	1	3	3	3	1				1	1	2	6	4
Fish			2	2							2	4	
Insecta			1	1									
Total	2	9	15	12	10	29	6	5	39	2	14	42	29

Abundant Mammals

Primates: In addition to the Fanjingshan monkeys, there are *Macaca thibetana* and *Macaca mulatta*. *Macaca thibetana* is the largest of *Macaca* in China, and it is one of the unique primate animals in China. *Macaca mulatta* is a representative species of tropical and subtropical primates in the Old World. Both monkeys are China's key protected animals (Photo 2.88-2.89).

Carnvora: There are two kinds of very rare carnivore animals in Fanjingshan, *Neofelis nebulosa* and *Ursus thibetanus*. The *Neofelis nebulosa* is the smallest member of Pantherinae, while its proportion of laniarii ranked first in Felidae, also known as the "small Saber-toothed tiger". Black bear is an endemic species in Asia, and its chest formed "V" shape or "U" shape by white and yellow short hair, so called "crescent bear." (Photo 2.90-2.91)

Artiodactyla: *Capricomis milneedwardsiis* is one of the typical animals in the tropical and subtropical regions of southeastern Asia. *Elaphodus cephalophus* is the only species which is found of *Elaphodus* currently, and is a primitive species of deer (Photo 2.92-2.93).

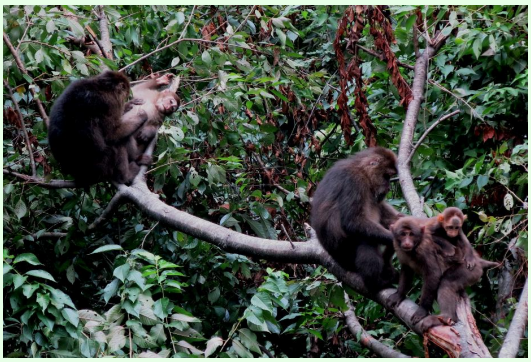


Photo 2.88 *Macaca thibetana*

Photo 2.89 *Macaca mulatta*

Photo 2.90 ***Neofelis nebulosa***

Photo 2.91 ***Ursus thibetanus***

Photo 2.92 ***Capricomis sumatraensis***

Photo 2.93 ***Elaphodus cephalophus***

Birds

Fanjingshan has a rich variety of colorful birds, such as *Syrmaticus reevesii*, *Syrmaticus ellioti*, *Chrysolophus pictus* and *Tragopan temminckii*, these four Phasianidae are not only rare, but also beautiful in rich colors (Photo 2.94-2.97).

Photo 2.94 ***Syrmaticus ellioti***

Photo 2.95 ***Chrysolophus pictus***

Photo 2.96 ***Syrmaticus reevesii***

Photo 2.97 ***Tragopan temminckii***

Amphibians and reptiles

Fanjingshan has abundant species of amphibians and reptiles. *Andrias davidianus* is the largest and most precious existing amphibian in the world, known as the "living fossil". *Vibrissaphora boringii,* which is known as the "Bearded frog" has almost disappeared from Mount Emei, however, they still exist and breed normally in Fanjingshan. The rare and large size *Quasipaa boulengeri* plays an important role in maintaining ecological balance in nature. The rare and endangered species *Deinagkistrodon acutus*, because of its severe toxicity, is also known as the "five steps snake" (Photo 2.98-2.101).

Photo 2.98 ***Andrias davidianus***

Photo 2.99 ***Vibrissaphora boringii***

Photo 2.100 ***Quasipaa boulengeri***

Photo 2.101 ***Deinagkistrodon acutus***

Insects

There are thousands of insects recorded in Fanjingshan, several are quite noteworthy including *Acanthacorydalis fruhstorferi* is the world's largest aquatic insect, *Stichophthalma howqua is the* largest butterfly in Asia and the endemic beetle *Carabus fanjingensis* (Photo 2.102-2.104).

Photo 2.102 ***Acanthacorydalis fruhstorferi***

Photo 2.103 ***Stichophthalma howqua***

Photo 2.104 ***Carabus fanjingensis***

2.a.6 Extent and methods of exploitation of natural resources

Fanjingshan is a remote area inhabited by ethnic minorities, including Tujia and Miao, Dong, Qiang and other ethnic minorities. These mainly based their communities on traditional agricultural production and secondarily on ecological industry. People live mainly in the outer edge of the nominated property, namely, the buffer zone. There are many kinds of land including cultivated land, forest, shrub, bamboo forest, etc. and residential area (Ren, 2002). The methods of exploitation of natural resources mainly include residential area, road area, and farm land. The forest utilization at the edge of the nominated property for herbal medicine excavation and tourism in Fanjingshan will inevitably have a certain impact in the ecosystem. All these minorities have respected the balance of nature for centuries and developed very sustainable ways of using forest products. Most have set aside sacred “feng shui” or lucky forests including the protection of some huge ancient trees.

(1) Transportation construction

Fanjingshan has constructed a total of 117 km in country roads that cover an area of 315.3 ha (Peng, 2011) for effectively strengthening the transport network of Yinjiang, Songtao and Jiangkou Counties. This is done to improve the traffic conditions in townships and villages adjacent to Fanjingshan, enhancing the ability of forest fire prevention of Fanjingshan, fostering the integration of tourism resources between Fanjingshan and surrounding areas, promoting the social and economic development in poorer ethnic minority areas. The ring road coincides with the low mountain evergreen broad-leaved forest, where the low mountain forest and the secondary forest below the altitude of 1,300-1,400 m cover smaller woodland areas. The road possesses a single habitat type, has little damage to the forest, but has had some effect on the passage of wild animals. In addition, there is a cable car developed to allow tourists access to the peak of the site without putting too much pressure on the terrestrial trails.

(2) Community activities

Fanjingshan is located at the junction of Jiangkou, Yinjiang and Songtao Counties. People of the nominated property live within several villages: Tuanlong, Dayuanzhi, Dingchang, Lingfeng and Kuaichang Villages of Ziwei, Luochang and Taiping Towns, where there are 718 households and 2,637 people. People of the buffer zone live within several towns: Taiping Tujia minority Town, Dewang, Ziwei, Muhuang, Chanxi, Luochang and Wuluo Towns with 4,974 households and 19,268 people.

The impacts of communities relate to residential land, agricultural production, livestock grazing, wood fuel collection etc. Before the establishment of a nature reserve, the local community had some disturbance to the natural forest and wildlife as a result of snaring for some game meat, cutting of firewood and construction poles, illegal mining for gold and copper and grazing of livestock within the forest. The following measures have made the resources of Fanjingshan much better protected, since the establishment of Fanjingshan Nature Reserve. Firstly, the laws strictly limit the residents' utilization of natural resources of Fanjingshan (Guo, 2007); Secondly, a community co-management system was established, emphasizing that the community have the right to participate in the management of natural resources, and promoting the development of communities based on the sustainable use of resources through the projects; Thirdly, by changing the way of ecological economy, turning the community towards the traditional cultivation of tea, walnut, chestnut, bamboo etc., and the traditional grazing industry into domestic culture; Fourthly, by turning the wood energy into liquid gas etc. through project implementation (Guo, 2007).

(3) Ecotourism

Fanjingshan is a significant scenic spot through eastern Guizhou travel routes, and is also an important part of travel routes from Guizhou to Hunan Province. Fanjingshan has gradually built some tourism infrastructure after it was listed as a UNESCO's Man and the Biosphere Programme in 1986. This was done to further people's understanding of Fanjingshan. Guizhou Province carried out a series of policies and measures about rapidly promoting tourism industry developments in the late 1990s to strengthen the development of tourism in Guizhou Province, which in turn promotes the tourism industry of Fanjingshan. Since 2009, Tongren City has launched publicity and promotion activities focusing on China Ecological Tourism Year to further enhance Fanjingshan's tourism image, which has increased the number of tourists from about 180,000 in 2010 to more than 360,000 in 2014 (Qiu, 2011) (Figure 2.21).

The visitors' number control is closely related to the ranging behaviour and reproductive success of *Rhinopithecus brelichi.* The majority of the nominated property is the core area of Nature Reserve, where is strictly forbidden to enter according to the *National Nature Reserve Management Regulations*. Based on *Fanjingshan Management Plan*, presentation zone account for 2.11% of total area of the nominated property, only a small part of which overlaps with *Rhinopithecus brelichi* range and potential range (Yang Yeqin, et al., 2002). The administration allows gradual growth of tourism numbers but monitor their impacts very closely. When tourist numbers start to damage the OUV, it is time to stop growth and reduce somewhat at sustainable levels.

Guizhou Sante Fanjingshan Tourism Development Limited Corporation is mainly responsible for Fanjingshan tourism projects on investment and construction, the operation and management, scenic spot garbage cleaning and transportation, sewage treatment, forest fire prevention security, etc. Aimed at potential tourist pressure, to ensure the quality of ecological tourism, the Corporation has restricted tourists to enter only some scenic spots of the nominated property, and the visitors entered to the nominated property per day is strictly limited to 8,000 persons. The tourist quantity and impacts are closely monitored and if it draws close to saturation that day, no more scenic spot tickets will be sold. Moreover, series of measures have been taken at individual scenic spots such as opening in different time periods with all the human activities carried out during the daytime to reduce the influence of human activities on the habitat environments of the plants and animals.

Fanjingshan was established as a nature reserve, and since then has become a member of the International Man and Biosphere Reserve Network in China, and is an important refuge for many rare and endangered animals and plants, demonstrating that the utilization and protection of natural resources is at the core of nature conservation and

development. The pattern and degree of influence on natural ecology of Fanjingshan will be carefully monitored and effective measures of protection will be strengthened through the site be inscribed on the World Heritage List.

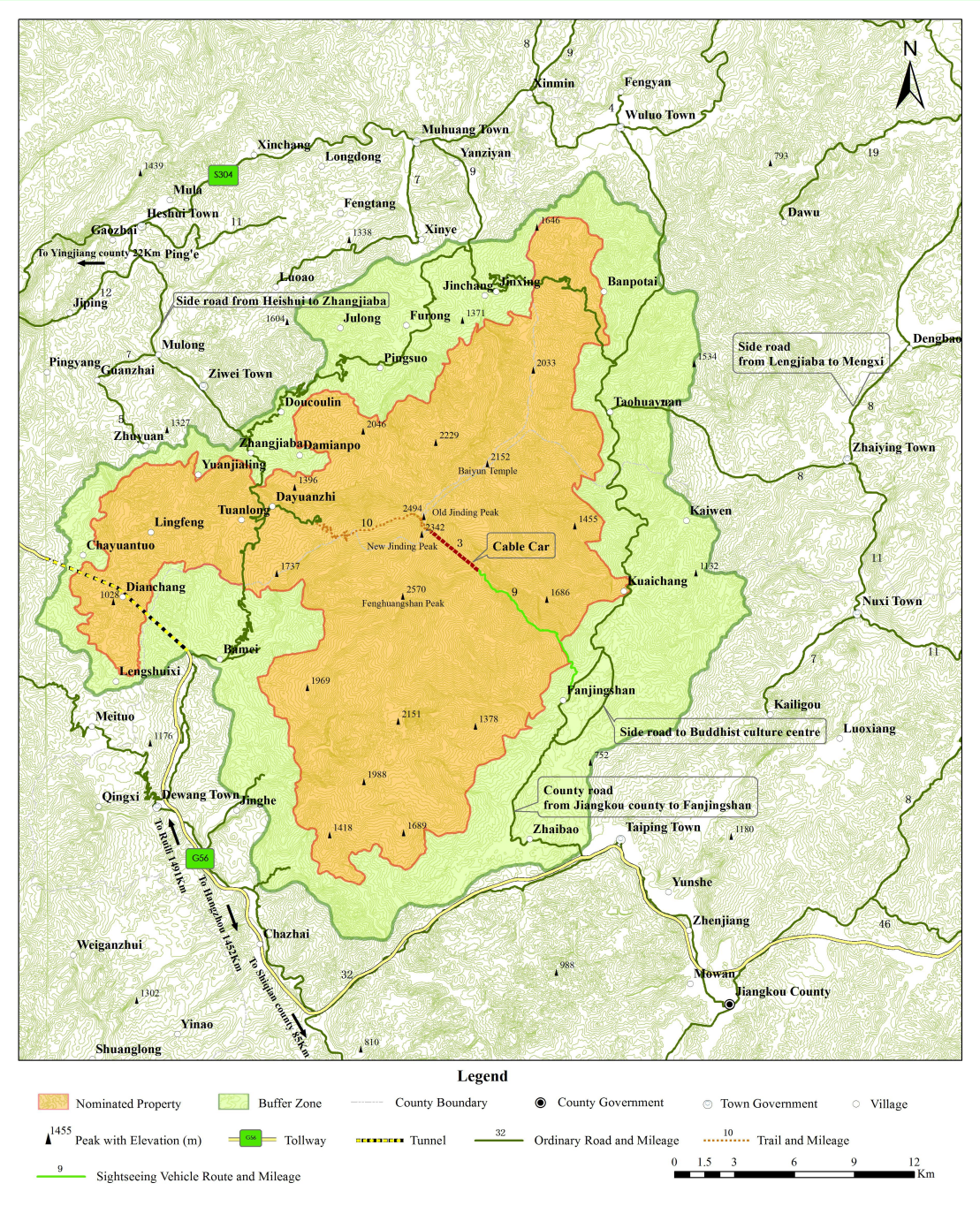


Figure 2.21 Access system map and distribution of human activities in the nominated property

2.b History and Development

2.b.1 History of nature

The nominated property of Fanjingshan is located in the southwest of Yangtze Block and the southeast is of North Jiangnan Orogenic Belt. Fanjing Group belongs to the middle basement rocks of Yangtze Block. The Fanjingshan area may be located in a unified continental block of South China in the early Proterozoic period, which was the product of intercontinental rift development stage (Red Sea type stage) in the Middle Proterozoic and its ancient environment became a rift basin in the Proterozoic (Wang, 1990). In the late Middle Proterozoic, the ocean basin closed due to the crust tension (He et al., 1990), and the pattern of Fanjingshan was formed after the following four periods. Fanjing-Wuling Movement (dating back about 1,000 Ma), Fanjing-Wuling Movement made Fanjingshan area experience intense folding and faulting on Fanjing Group. Therefore, they formed Zhangjiayan and Heiwanhe Hollows and Niufengbao Swelling (Yang, 1986). Xuefeng Movement: Fanjingshan area was uplifted to be dry land by the Xuefeng Movement and became a region which has experienced repeated uplift and frequent erosion. The basic structure of Fanjingshan was established. Yanshan Movement did not only make the surrounding sedimentary cover of Sinian and Triassic Systems generate intense deformation, folding and fracture, but it also made the base structural strata of Fanjing Group and Banxi Group suffer deformation and fracture, and magma activated again. This resulted in the basic structural pattern of Fanjingshan had been formed. Up to now, the Himalayan Movement and Neotectonics movement has resulted in further uplift, resurgence or exacerbate (Yang, 1986).

A large number of fossils, sporopollens and current life forms record the biological adaptation to long-term climatic change and the life evolution processes from ocean to land and fresh water. Such evidence can be found in Fanjingshan. This includes prokaryotic cyanobacteria and trilobites of the Cambrian Period; brachiopods, cephalopods and graptolite fossils of the Ordovician Period; psilophyton of the Silurian Period; Corals, Brachiopods, Gastropods, Lamellibranchia, Foraminifera, Ostracods, and trilobite fossils of the Devonian and Carboniferous Periods; corals and brachiopods of the Permian Period; and the gymnosperms and ferns' prodigious biological components of the Triassic and Jurassic Periods. In addition, during the Quaternary Ice Age, the ancient relict plants were not affected greatly and were preserved. Through the process of evolution, life continued to adapt to new conditions in today's diverse climates and under human beings' protection. Most ecosystem structure and functions are well preserved in the nominated property, and in a relatively balanced condition.

Terrestrial life came into being in Fanjingshan in the Tertiary, according to distribution of existing early Tertiary relict plants such as *Liriodendron chinense*. The nominated

property has gradually formed a variety of small terrains or niches in the Tertiary Himalayan orogenic movement, which created favorable conditions for the reproduction and differentiation of the ancient terrestrial higher plants. The nominated property has formed forest vegetation that was dominated by montane evergreen oak in the Pliocene. Because the new tectonic movement intensified the continental climate after the Pliocene, the component of the northern and southern flora and fauna were mixed and the forest vegetation of the nominated property has evolved into the subtropical evergreen and deciduous broad-leaved mixed forest that consisted of *Quercus, Cyclobalanopsis glauca, Castanopsis fargesii, Symplocos caudata, Fagus longipetiolata, Betula, Aceraceae* and others in the mid Holocene. Fanjingshan has long been home to *Rhinopithecus brelichi, Panthera pardus, Viverridae, Capricornissumatraensis, Sus scrofa* etc during the mid and the late period of Pleistocene. The sub alpine dark coniferous forest migrated to low altitude of 2,000 m where it gradually replaced the mountain part of the broad-leaved forest, because the climate turned cold in the Quaternary glaciation. While the sub-alpine dark coniferous forest was preserved in suit and adapted to the new environment to form a new community, their habitat ranges gradually reduced in the interglacial period and new population appeared, such as *Abies fanjingshanensis*.

Photo 2.105 Fanjingshan

Fanjingshan is one of the earliest terrestrial areas in Guizhou Province preserving the abundant ancient relict life in the Tertiary and Quaternary, including the *Ginkgo biloba, Liriodendron chinense, Cercidiphyllum japonicum Sieb, Tetracentron sinense, Abies fanjingshanensis, Tsuga chinensis, Taxus chinensis, Rhinopithecus brelichi, Panthera pardus, Viverridae, Sus scrofa*. These reflect the history of ancient life of Fanjingshan. As human beings had less interference to the ecosystem and the biological diversity, and because the ecological system had been protected by the national laws and community residents in the long history of the natural development of the nominated property, ongoing ecological process of the ecological system and the natural life, continuous evolution is ensured.

2.b.2 History of human activities

The nominated property of Fanjingshan has a long history and splendid culture spanning from Paleolithic and Neolithic to contemporary times.

Neolithic relics have been excavated in the neighboring areas of the nominated property showing that human beings began to live here in the Neolithic Age (The County Annals' Compilation Commission of Songtao Miao Autonomous County, 1996). Tombs of the Han Dynasty have been found in the surrounding areas of Fanjingshan such as Songtao, Yanhe, Mayang etc., showing progressive development at that time. The nominated property was brought into sharp focus by the punitive expedition of Wuximan by General Mayuan in eastern Han Dynasty, so the central plain people should have known that Fanjingshan is the headstream of Chenshui (Zhang, 2005).

Before the Ming Dynasty, Fanjingshan was once seen as a barren wasteland where the residents were divided into the indigenous people and migrants who wanted to avoid the wars and natural disasters of the past, and were always referred to barbarians by the Central Dynasties of China. The social background of spreading Buddhism in Fanjingshan is a feature of their 'barbarian' culture and the ecological region (Chen and Xiao, 2013), and it attracted much attention of the central dynasty on account of the close relationship between Fanjingshan and Buddhism.

After Ming Dynasty, the history of human activities in the nominated property and its surrounding areas is a record of war and the rise and fall of Buddhism. In the early Song Dynasty, Buddhism was spread to the surrounding regions of Fanjingshan, and one of Guizhou's earliest temples, Xiyan temple (now in the western suburbs of Yinjiang County), was built after the Ming Dynasty. Some part of the ecological environment in the nominated property was destroyed because of the war, the immigration of Hans and recorded gold panning. Especially in the 27th year of Emperor Wanli of Ming Dynasty (1599), Yang Yinglong, the herald of Xuanwei in Bozhou (now in Zunyi of Guizhou

Province), launched a rebellion; in the 2nd year of Emperor Tongzhi of Qing Dynasty, Liu Sheng, the leader of the residual department in Taiping Army, made Fanjingshan the base for 10 years of revolution which damaged many temples. Many monks escaped, however, it did affected Buddhism in the area. Fanjingshan experienced two reparations, one by Monk Xuanmiao appointed by emperor Shenzong of the Ming Dynasty, and the other by Monk Longcan in Guangxu period. In the period of Kangxi and Qianlong, Fanjingshan had Five Major Reguis Buddhist Convents and Forty-eight major Jiao Buddhist Convents. Fanjingshan had a great reputation for its numerous monks and emerged as a Buddhist Shrine which became as famous as Emei and Jizu. From the late Qing Dynasty to the early Republic of China, Fanjingshan experienced repeated wars and the Buddhist site had been repeatedly destroyed and rebuilt. After the liberation of China, some reserved temples were destroyed as the “four olds” during the Cultural Revolution; the mountain which has a one-thousand-year history declined. With the implementation of the religious policy, the worship atmosphere of Fanjingshan was gradually restored, and the culture of ancient Fanjingshan was re-energized (Liu and Dai, 1999).

The ethnic minorities in the nominated property and its buffer zone which combine mountain spirits with totems worship, such as Tujia, Miao, Dong, Gelao, etc., were always discriminated against as barbarians by the Central Dynasties (Yu, 2006). The combination of Fanjingshan spirit and totem worship which originated in the worship of animals and plants made the forest, animal and plant resources complete in the nominated property. This has resulted in the integrity of forest and fauna and flora. After the 1980s, the resources of forest and wildlife in the reserve have been adequately protected on account of the constitution, laws and regulations and the designation of Fanjingshan National Nature Reserve.

2.b.3 History of conservation and management

Fanjingshan has a long history of protection. The original condition of the vegetation in the nominated property is closely bound up with the environmental awareness and distinctive cultural beliefs which go beyond the more recent formal protection of the property as Fanjingshan National Nature Reserve and Yinjiang Yangxi Provincial Nature Reserve. This sense of cultural stewardship by indigenous people has also exerted a great effect on the ecological environmental protection of Fanjinghsan and leaves a huge ecological wealth for future generations. From the conscious protection period when people had simple respect for nature to the period of government protection through laws and regulations, Fanjingshan’s protection has been progressively increased and become more effective.

(1) The active protection of the consciousness of indigenous people

In the nominated property and buffer zone no less than 10 different ethnic minorities have lived for many centuries. All of these have developed cultural conservation behavior towards preserving the forest. The indigenous people were kindhearted and practiced animism and worship of ghosts. They considered the forest vegetation of the mountains as playing an important role as a water source and in soil conservation. They also believed that the wild animals were the good spirits of the mountain. So they protected and respected these resources. They were in awe and had great respect for nature, resulting in them never taking too much from nature. As is shown by the inscriptions which remain, the indigenous people in the nominated property have simple dialectic thoughts, and were well aware of the co-existence between water and trees and the dependency-relationship between people and trees (Xing and Ma, 2004). With historical changes, the traditional practices of indigenous people to protect the ecological environment and natural resources have so far been preserved, and still play an important role. Slogans, such as “Forest Reservation”, “No Quarrying”, “No Felling”, “No Fishing”, etc., can be seen everywhere in the nominated property and its surrounding villages, and the clause about protection of trees, such as no clearing of the forest by fire and no destroying young trees, can be found in most local rules and regulations valid for the whole village. Cutting was recognized as 'unlucky' leading to landslides and the dying of water sources. Most minorities actually define and protect “Fengshui” forests to ensure healthy environment and good luck. Indeed, we find the largest and oldest trees of *Cinnamomum* and conifers revered in such Fengshui forests, these old trees provide growth ring data that record the changing climate conditions for the last one thousand years and are especially revered, protected and used as shrines for prayers and offerings to the spirits of nature. Today, with the active protection of the consciousness of indigenous people, the nominated property has the most primary forest ecological system at equivalent latitude than anywhere on earth.

The conservation of the nominated property is also closely related to the history of Buddhist development in southeastern Guizhou Province. Buddhist activities in the nominated property generally began in Tang Dynasty, developed during the Song Dynasty, and flourished in Ming Dynasty. Since Ming and Qing Dynasties when religious activities were popular, the forest in the nominated property has been treasured by the ancients. Jing Wen, a magistrate of Shiqian County in the Qing Dynasty, wrote in the *Fanjingshan Forbidden Tree Inscription*: "the essence of mountains and rivers is vegetation, the bones of a county are mountains and rivers", and proposed that the forest of Fanjingshan should be "always protected from cutting" and “never be burned for charcoal”. It is the duty of feudal local government officers to protect the forest in the

nominated property. Therefore, the forest in the nominated property has been preserved in relation with the traditional protection of indigenous people.

(2) Government protection and management

As noted above the nominated property has a long history of protection. Traditional stewardship practices through until more recent Government legal protection have together ensured increasingly effective protection for Fanjingshan's resources. The following milestones trace the more recent Government protection of the nominated property:

In 1956, Fanjingshan was designated as a non-deforestation area of a natural forest (a nature reserve) by the Ministry Forestry of China.

In 1978, according to Document Qiantongzi (78) No.113, Fanjingshan Nature Reserve was founded and a special management agency was set up.

In 1981, under the leadership of the higher authorities, the scope and boundaries of the Fanjingshan Nature Reserve were delimited by the Fanjingshan administration together with three counties.

In 1986, Fanjingshan Nature Reserve became one of the first 17 national nature reserves approved by State Council (86) File No. 75. In the same year, it was admitted to be a member of the World Man and Biosphere Reserve Network by the UNESCO International Coordinating Council, and became the Fourth International Biosphere Reserve in China.

In 1989, according to Guizhou Government (89) File No. 13, the original Fanjingshan Nature Reserve in Tongren was renamed "Fanjingshan National Nature Reserve in Guizhou" by the People's Government of Guizhou, and became the affiliated institution of the Forestry Department of Guizhou Provence definitely.

In 1990, work analysing forest rights was completed as were the scope, boundaries and area of the State-owned forest in Fanjingshan National Nature Reserve.

In 1991, Tongren, commissioned by the People's Government of Guizhou Province, issued a State-owned forest right certificate to Fanjingshan National Nature Reserve Administration (formerly Management Office), and divided the administration of the reserve, and carried out work on protection, scientific research and development.

In 2000, Yangxi Wildlife Nature Reserves was established in Yinjiang County.

In 2014, *Master Plan on Guizhou Fanjingshan National Nature Reserve (2014-2023)*, was compiled by the Planning and Design Institute of Forest Products Industry Planning

and was approved by provincial experts and awaits approval from China's State Forestry Administration.

In 2015, *Master Plan of the Yinjiang Yangxi Provincial Nature Reserve in Guizhou (2015-2024)*, compiled by the Guizhou Academy of Forestry Science, has been approved by county-level experts. It means that various activities on planning and declaring the construction of Yingjiang Yangxi Provincial Nature Reserve by Yinjiang Tujia and Miao Autonomous County have been officially launched.

In 2016, according to Guizhou Government (2016) File No.173, Yangxi Wildlife Nature Reserve became a Provincial Nature Reserve authorized by the Government of Guizhou Province.

In addition, the northeast of the nominated property, which belongs to the National Non-Commercial Forest, is out of the two nature reserves. The Forestry Bureau and Forest Public Security Bureau of Tongren are responsible for its inspection, protection and management under the guidance of the Guizhou Provincial Forestry Department.

3. Justification for Inscription

3.1.a Brief synthesis

3.1.b Criteria under which inscription is proposed (and justification for inscription under these criteria)

3.1.c Statement of integrity

3.1.d Protection and management requirements

3.2 Comparative analysis

3.3 Proposed statement of Outstanding Universal Value

3. Justification for Inscription

3.1.a Brief synthesis

Fanjingshan is located in the sloping transition zone of the Yunnan-Guizhou Plateau, to the hills of Western Hunan. Fanjingshan is the main peak of Wuling Mountains and also part of the divide between the Wujiang and Yuanjiang Rivers. Its main peak named Fenghuangding Peak is 2,570 m above sea level, and the property has a vertical mountain elevation difference over 2,000 m.

The total area of the nominated property is 40,275 ha, and the buffer zone covers an area of 37,239 ha, extending 27.75km from east to west and 34.07 km from south to north.

After the Indosinian movement at the end of the Triassic Period, this area has experienced a process of land regression, and uplift. After the Yanshan, Himalayan and neotectonic movement, the dome mountain landscape pattern today was formed. The mountain is mainly composed of metamorphic rocks and is surrounded by contrasting karst low mountains and hills, forming a landscape 'island', the foundation of a series of unique natural processes, including the development and evolution of its terrestrial life and the formation of the natural landscape.

Fanjingshan is located in the meeting point of subtropical zone and oriental deciduous forest within the Oriental Deciduous Forest biogeographic province of Udvardy (1975). Towering over and relatively independent of its surrounding karst landscape Fanjingshan exhibits a unique mountain ecosystem. Indeed, we can recognize Fanjingshan as an entire and intact micro-biogeographical region, a virtual biogepgraphic 'island'. It is extremely rare among subtropical mountain ecosystems that Fanjingshan has been able to maintain its integrity, original condition and a forest vegetation coverage rate of more than 90%. It has a wide range of ecosystem types including zonal evergreen broad-leaved forest, warm coniferous forest, temperate broad-leaved forest and dark coniferous forest, etc. Thus, this area is not only a significant intersection - a bridge between the flora of South China and Central China, the West, Central and East China, but also a transitional zone where the vegetation changes from tropical to temperate. Evergreen broad-leaved forest and evergreen and deciduous broad-leaved mixed forest are the main forest types, whilst special vegetation types of the oriental deciduous forest region are found. *Fagus* (beech) as the main components of the evergreen deciduous broad-leaved forests and deciduous broad-leaved forests and *Abies fanjingshanensis* (Fanjingshan fir) forest as the main composition of the subalpine coniferous forests are

unique among the global vegetation types. The evolution and development of Fanjingshan's vegetation from ancient to modern forms is evident in the sporepollen record, but a considerable number of ancient relict plants are retained, succession of marsh vegetation from terrestrial vegetation is evident and centralized differentiation of endemic plants can also be documented. These facts synthetically reflect that the global humid subtropical monsoon climate zone subalpine mountain ecosystems are subject to dynamic and ongoing biological and ecological evolution process. This is an important process which reveals the evolution of paleoclimate, ancient geography, ancient ecological environment and paleovegetation.

Records of terrestrial life in Fanjingshan originate from the Tertiary Period or earlier. Due to its unique location, and slightly influenced by the Quaternary glaciation, a great number of ancient organisms were retained, but a number of other species and colonizers show differentiation and spread after warmer climate predominates. Therefore, rich biological species have been contained in this relatively small area and Fanjingshan has become one of the relatively richest biological diversity areas in the Oriental Deciduous Forest biogeographic province. Up until now, an astonishing 7,161 species of wild animals and plants, including 4,394 kinds of plants and 2,767 types of animals have been recorded in the nominated property. Fanjingshan has the largest *Fagus* forest in the subtropical region, and it is the most important preservation area globally for the Chinese species of *Fagus*. What is more, Fanjingshan is the only habitat on the planet for the keystone Guizhou Snub-nosed Monkey *Rhinopithecus brelichi,* a rare, endangered and endemic animal. Its survival and reproduction is closely related to the concentrated and extensive distribution of *Fagus* forest in the nomination property. The Snub-nosed Monkey and its habitat thus attract great attention from the international scientific community. In addition, Fanjingshan is one of the world's richest habitats for conifer diversity including being the only home of the endemic and endangered fir tree *Abies fanjingshanensis*, whose existence here contributes significantly to the acknowledged richness of China's flora; and provides a precious gene pool for global conservation, and an important base for scientific inquiry. Fanjingshan is an important habitat for the differentiation and development of many endemic species, such as the endemic persimmon *Diospyros fanjingshanica,* endemic kiwi fruit *Actinidia fanjingshanensis,* endemic deer *Muntiacus reevesi* subsp*, jiangkouensis and* endemic beetle *Carabus fanjingsensis,* etc. Moreover, Fanjingshan is not only a significant differentiation center of many endemic bryophytes such as *Distichophyllun oblongum* var. *fanjingensis, Kurzia sinensis* and *Scabridens sinensis* etc, but also the habitat of a variety of rare and endangered species and a major refuge for ancient relict plants. With

its unique physiology, isolation, geographical position, biological richness, narrow range endemism and continuing evolution, Fanjingshan is an outstanding key place for the in-situ conservation of biological diversity.

The nominated property boasts a magnificent altitudinal zonal series of subtropical landscapes - mountain landscape, water landscape, biology landscape and climate landscape, comprising an outstanding diversity of extremely beautiful landscape units, which not only displays the biological and ecological landscape and the peculiar rock landscape, but also shows the elegance of isolated peak landscape and valley landscape, as well as the mystery and changes which come with climate and season. Fanjingshan boasts an outstanding ecological environment, and also a model of harmony between people and nature in this subtropical mountain area. It is a rare and exceptional example of a subtropical vault mountain forest ecosystem, forming numerous unique species and species combinations, and is also a natural habitat of many rare animals and plants which together enrich the aesthetic characteristics of the nominated property's landscape.

One reason for the sites excellent natural conditions is that it has for centuries been protected as a sacred Buddhist cultural landscape and also respected by the traditions of several ethnic minorities, whose sustained selective use of forest resources add to rather than detract from natural values of the site and form the basis of its earlier nomination as a UNESCO Man and the Biosphere reserve.

The biological and ecological values of Fanjingshan have been widely acknowledged and protected by both society and government and its aesthetic landscape has been promoted and praised by visitors and community residents. The biological and ecological system and natural landscape resources of Fanjingshan boast of an outstanding universal value and significant potential value in keeping the biological diversity and stability of the region - an asset for the whole world, benefiting the production and livelihoods of community residents and regional sustainable development. Here is a natural wonder of multiple values - an outstanding site for protection, inspirational recreation, research and education for present and future generations.

3.1.b Criteria under which inscription is proposed (and justification for inscription under these criteria)

According to the criteria for the assessment of Outstanding Universal Value defined in *the Operational Guidelines for the Implementation of the World Heritage Convention (2015)*, the nominated property of Fanjingshan meets the following criteria: (vii), (ix), (x).

Criterion (vii) To contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance

Fanjingshan has changed its name many times through history but has always been recognized for its mysterious and wondrous beauty. It is revered in countless stories, poems and histories, admired by so many domestic and foreign visitors and scholars and attracts huge numbers of visitors.

Fanjingshan is a large area with a significant elevational range of more than 2,000 m. The valleys and gorges are distributed alternating with the mountains, which resemble knife-edge ridges. Based on the outcropping metamorphic detrital rocks, Fanjingshan has developed spectacular cliffs, peaks, and column landscapes, because of the horizontal rock formation, the vertical splitting and the steep angles of joint surfaces. Some of the peaks' bodies are broken, resembling broccoli, and some have collapsed, only leaving a lonely isolated peak, which is quite strange and steep. Many of the strange rock forms have been given their own names and have their own legends.

The rivers of Fanjingshan radiate from mountain peaks, which were called '99 rivers', there are numerous rushing rivers and streams, cascades, rapids, tall pencil waterfalls. The waterfalls are located at three elevations, 23 waterfalls of which are above 15m high. Also there are spectacular and amazing weather landscapes, especially the sea of clouds, rainbows, mirages and the strange 'Buddha's light'. The seasonal and weather landscapes changing irregularly in the mountains are beautiful and magnificent.

Besides its physical glory Fanjingshan's wealth of beautiful and fascinating biodiversity adds much to the enchanting scene: the endemic Snub-nosed monkeys and other endangered species; more than 4,000 species of plants and more than 2,000 species of animals, such as stunning pheasants, spectacular hillsides of flowering azaleas *Rhododendron*, fluttering white bracts of the Chinese dove tree *Davidia*, dainty Chinese little leaf box *Buxus*, stately *Abies*, *Tsuga chinensis*, *Juniperus squamata* and many more.

The natural beauty of Fanjingshan depends on its abundance and the endless changes in the landscapes, which reflected the obvious vertical differences, also the obvious temporal changes, including seasonal changes and the instantaneous changes in weather conditions. The landscapes are very different from top to bottom of the mountain due to the elevational range and terrain. There are many valleys shaded by evergreen forests in the foothills, while there are particular stone peaks at the top of the mountain giving great views of the spectacular landscapes and other distant and steep mountains.

The green Fanjingshan has a wonderful ecological environment; the forest landscape consists of the different beautiful plant groups, such as orchids, ferns, dove trees, firs, and azaleas. Fanjingshan's forest landscape changes obviously with the season, because of the subtropical monsoon climate zone, where rain and high temperatures appear in the same period. Flowers of all sorts are blooming in a riot of colour in spring; and the mountain has a luxuriant growth of vegetation in summer; it is gorgeous in the golden fall; and it is magically snow-coated in the winter. The sudden weather changes are another reason for the natural beauty of Fanjingshan, especially in spring and summer when there is much more cloud. Sometimes the clouds darken the sky, just seconds later, they vanish at the top of the mountains; or the cloud just appears at one side of the mountain ridge, the sun shines at the another side, the clouds flutter through the peaks, which creates a particularly mysterious experience.

As the base of the symbolic landscape of Fanjingshan, the metamorphic detrital rocks make the landscape so unique among the famous granite or basalt mountains. In addition, comparing with those other famous mountain, Fanjingshan is far away from the central China, which means it has been impacted less by human activities and therefore maintains its natural beauty.

Criterion (ix) To be an outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals

Fanjingshan is an outstanding and unique site for exhibiting ongoing ecological and biological processes. We can recognize 3 such processes.

1) Unique geological origin and evolution of an ecological 'island';

2) Island biogeographical patterns of colonization and speciation over prehistoric and historic time frames including responses to increasing isolation as surroundings were converted;

3) Unique pollen record of vegetation climate changes over long term and recent changes in response to accelerating human induced climate change.

Fanjingshan is a unique and beautifully documented case of the evolution of an ecological 'island'

After millions of years under the sea and the intermittent deposition of thousands of meters of coralline carbonate sediments, Fanjingshan was uplifted by the Himalayan

Movement since 96 Ma BP at the late stage of Cretaceous Period, on the basis of the geological background during the Yanshan Movement. The climate at that time was hot and dry, and denudation was dominant. Carbonate rocks covering the metamorphic rock base of Fanjing Group and Banxi Group were eroded revealing the non-karst island region of Fanjingshan as a contrasting 'Habitat Island'. This laid the foundation for the prototype of Fanjingshan and its vertical climatic belts. Since 2.6 Ma BP of Quaternary Period, the Neotectonic Movement caused Fanjingshan to experience more intense lifting and radial river headward erosion, forming a high and medium mountain above 2,500 m with a domal center and deep-cutting gorge landform in the surrounding areas. Hence, the island mountainous region and vertical climatic belts have been formed. Due to frost weathering and periglacial processes of the Quaternary Ice Age and for about 10,000 years since the Holocene, the Banxi Group has almost been totally denuded, and the river valley in the peripheral area of mountainous region has been widened, dominated by low mountains and hills.

The forests on the non-karst metamorphic rocks have developed lush and green, much richer than the surrounding karst 'sea'. The contrast in colour is clearly evident on remote sense imagery and the comparison of plant species between the nominated property of Fanjingshan and its surrounding karst environment shows a coincidence of species of only 25% which is comparatively low. For 75% of the flora, Fanjingshan truly behaves like an island. The mountain remains geologically dynamic and continues to rise and erode.

Fanjingshan is one of the oldest natural laboratories for the study of island biogeographical patterns of colonization and speciation

As predicted by island biogeography theory, the species richness for such a large island is higher than for smaller islands and the island provides an opportunity for rapid evolution through the emergence of local endemic species and forms.

The height and complexity of the island provide a wide range of habitats to promote biological richness and the steepness of the slopes means that adjustments of species to changing temperature caused by changing climate can be readily made by only very small vertical shifts of distribution. Hence Fanjingshan has been an excellent refuge during the dynamic climate shifts of the Pleistocene period preserving many ancient and relict species. This bodes well for the future and indicates high climate resilience.

As climate gets colder, species move south, and as climate gets warmer, they can extend their distributions northwards. As climate gets wetter, they can extend westwards

and when drier they need to move back eastwards. Thus species have been able to more easily move in response to these dynamics creating a fauna and flora of mixed distribution types. The genus of the flora of Fanjingshan is 47% temperate, 40% tropical, 8.3% endemic to China and 4.7% cosmopolitan. The temperate component contains genera of Himalayan affinities and genera of Sino-Japanese and even Sino-North American affinities.

As lands around the nominated property have been opened up for farming, plantations and continuing development, the 'island' of Fanjingshan gets slightly smaller and more and more isolated from any 'source' forests. We would predict a drop in the recruitment rate of new or recolonising species and an increase in local extinction rates. Continued monitoring of species turn-over and possible arrival of alien species can provide much useful information on the resilience of the Fanjingshan ecosystems.

Fanjingshan holds a unique record of evolving forest composition and responses to changing climates

There are three lines of evidence allowing examination of the long-term responses of the vegetation to changing climate.

a) Analysis of what species have been able to colonise and then thrive in Fanjingshan allows a lot of deduction about the ecological evolution of the site.

b) Paleo-spores sampled from the Jiulongchi wetland allow dating of vegetation communities for several thousand years. These reveal climate amelioration resulting from general warming since the last Ice ages but also contrary harsher climate fluctuations that result from the continued uplifting of the mountain.

c) Growth rings taken from the most ancient trees - many over a thousand years old - will allow a detailed reconstruction of the climate over the past several hundred years and help generate a better interpretation of the current distribution of trees and vegetation zones.

The dynamic evolutionary processes from Pliocene onwards, which is revealed by paleo-spore records corresponding paleobotany records in the nominated area, indicates evolution from mountain evergreen oak forest to mountain mixed evergreen and deciduous broad-leaved forest, and then extending to the stable vegetation as seen today. Meanwhile, comparing with the extant vegetation and the paleo-spore recording vegetation provides evidence of vegetation evolution responding to the rising landform. The presence of numerous ancient endemic plants also reveals the antiquity of the

Fanjingshan's ecosystem, inheritance and development from paleobotany. Accompanying the new species formation, the record and ancient endemic plants prominently reveal the vegetation evolutionary process from ancient to present times impacted by landform and climate changes. In addition, 'Jiulongchi' is a shrinking sub-alpine marsh with elevation of 2,212 m, and the vegetation is evolving from wetland vegetation to xerophytic vegetation, which demonstrates the ongoing evolution and climate change.

The outstanding mountain forest ecosystem of Fanjingshan is the most distinguished representative of Oriental Deciduous Forest province evolutionary mountain ecosystem

According to the impact of geographical location, landform and climate, the nominated property stretching to the northeast is not only the transition point for tropical and subtropical vegetation plants spreading from south China to southwest, mid-terrene and northeast China, but also the barrier for Himalaya forest plants spreading from western China to eastern and mid-terrene China, as well as the south-to-north and west-to-east intersectional region of Chinese plants and transition area of tropical flora and temperate flora. In the case of the south-to-north transition process, tropical plants dominate the Fanjingshan plant genera. However, in the case of east-to-west transition process, evergreen and deciduous forests are equivalent as the evergreen and deciduous species fiercely competed and resulted in the equivalent area of evergreen broad-leaved forest and mixed evergreen and deciduous broad-leaved forest which are the two main ecosystems here. Therefore, Fanjingshan, located at the southern extreme of the Oriental Deciduous Forest province, is not only the outstanding representative of flora intersection area, but also the typical example of equilibrium evolving ecosystem of mid-subtropical middle mountain evergreen broad-leaved forest and mixed evergreen and deciduous broad-leaved forest.

Fagus forests used to have more global distribution in the Tertiary, but show disjunctive distribution at present because of environmental changes. However, Fanjingshan represents a subtropical continuous distribution of *Fagus* forests, which preserves the most abundant species and the biggest area in the subtropics, unparalleled worldwide. So Fanjingshan guarantees the most important refuge for global *Fagus* forests evolution research. Meanwhile, Fanjingshan *Fagus* forests support plenty of undergrowth plants and contribute to the seasonal bimodal community distributions which provide an extremely critical refuge for subtropical to temperate forest vegetation research and represent the transition characteristics of tropical and temperate vegetation. Moreover, Fanjingshan *Fagus* forest has the most dominance and controlling effect on ecosystem

functions, which is unique in the vertical vegetation zonality.

Criterion (x) To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation

Due to the relatively isolated and rugged mountain landform, the nominated area exhibits unique climatic advantages differing both from the south subtropics and the northern subtropics, is rich in different habitats and hence supports flourishing resident species. The nominated property has preserved a quantity of ancient, relict, rare and endangered species and also differentiated several endemic species with global representive significance. This indicates the nominated area is such an important habitat for endangered species and outstandingly valuable for science and conservation.

Fanjingshan is the unique habitat and a key place for the in-situ conservation of the endemic and endangered Guizhou Snub-nosed monkey - *Rhinopithecus brelichi* and fills a series gap in the WH coverage of the entire range of different Snub-nosed Monkey species.

Guizhou Snub-nosed monkey (*Rhinopithecus brelichi*), is an ancient species known since the Middle and late Pleistocene. This is a very rare *Rhinopithecus* only found in Fanjingshan, an endangered species recorded in the IUCN Red List of Threatened Species, also listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and on the first grade of The Lists of National Protected Wildlife of China. Fossils and reference records reveal that *Rhinopithecus brelichi* used to be distributed more widely in eastern and northern Guizhou Province, but today remains only in Fanjingshan. The recent monitoring data show only a maximum of 750 individuals surviving in total, which indicates that *Rhinopithecus brelichi* is the smallest population among four *Rhinopithecus* species in China and is a remarkably precious and irreplaceable gene bank for global species. There are plenty of mixed evergreen and deciduous broad-leaved forests, deciduous broad-leaved forests and evergreen broad-leaved forests preserved at Fanjingshan area that offer enough tree species for *Rhinopithecus brelichi*'s seasonal feeding needs and advantageous habitats for hiding, playing and breeding (Photo 3.1). Because *Rhinopithecus brelichi* is found at very limited area, has very few individuals and slow breeding rate, the preservation of *Rhinopithecus brelichi* is given high attention by international conservationists.

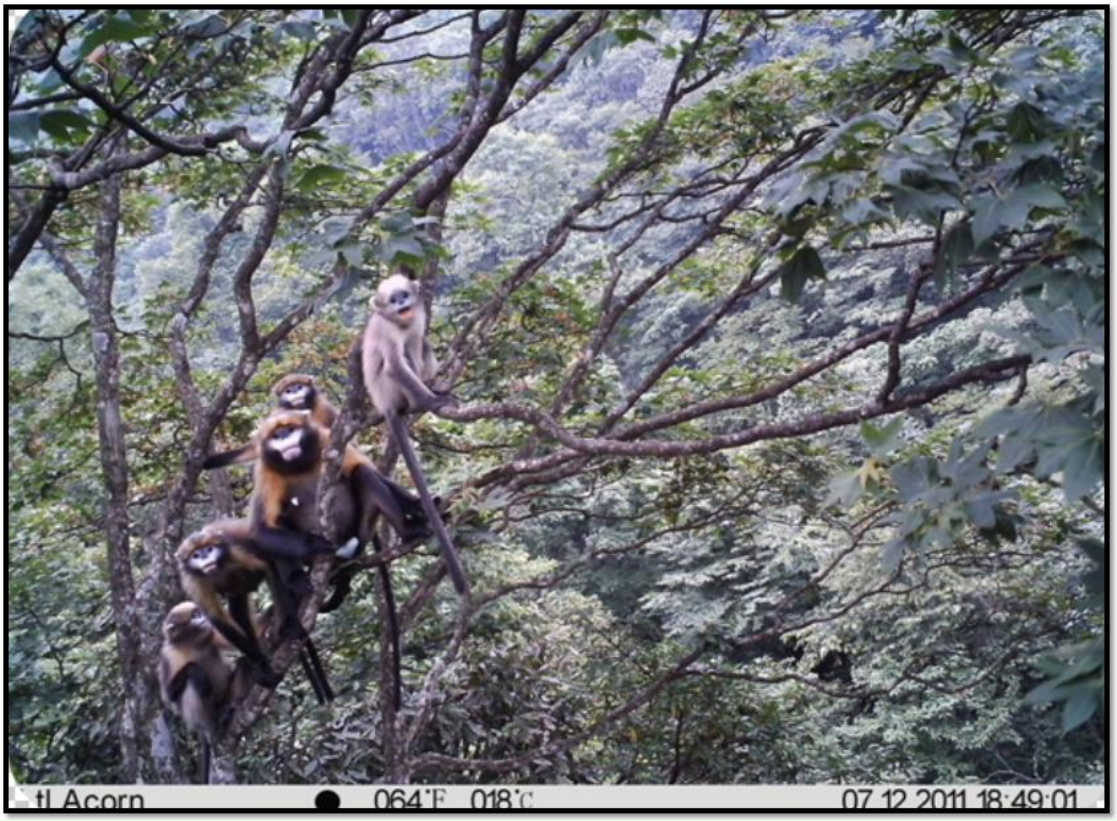


Photo 3.1 *Rhinopithecus brelichi* (Guizhou Snub-nosed monkey) and its habitat in the nominated property.

Rhinopithecus or 'Golden Monkeys' are an iconic wildlife genus endemic to China and marginally adjacent eastern Burma and northern Vietnam. This is the original of the famous Monkey King of Chinese legends and the Monkey symbol of the Chinese zodiac. The other three species of *Rhinopithecus* in China are all preserved in World Heritage sites and form a nice natural series. The addition of the Guizhou Snub-nosed monkey completes this series (Table 3.1).

Table 3.1 Fanjingshan is the unique habitat and an irreplaceable locality for in-situ conservation of the ancient, endemic and endangered animal - *Rhinopithecus brelichi*

Golden Monkey Species	Included in World Heritage sites or tentative sites
Rhinopithecus roxellana	Sichuan Giant Panda, Jiuzhaigou, Huanglong
Rhinopithecus bietii	Three Parallel Rivers (Laojunshan, Meilixueshan)
Rhinopithecus strykeri	Three Parallel Rivers (Gaoligongshan)
Rhinopithecus brelichi	Fanjingshan

Note: The Vietnamese species *Rhinopithecus avunculus* is recorded in the Ba Be Lake in the tentative list.

Fanjingshan is the key place distribution of endangered plant *Abies fanjingshanensis* and in-situ conservation

Fanjingshan fir (*Abies fanjingshanensis*) is a restricted range endemic and ancient species known since the Middle and late Pleistocene, and an important coniferous tree species listed in IUCN's “Coniferous Tree Conservation Plan”, an endangered level species recorded in the IUCN Red List of Threatened Species, and the first grade of The Lists of National Protected Wild Plant of China. *Abies fanjingshanensi*s has a limited distribution at the upper part of the Fanjingshan mountain slopes, and protects a precious seed bank for the world. The occurrence of *Abies fanjingshanensis* results from the plateau’s subsequent great rise, and is sensitive with climate change, so it becomes the indicator of long-term global climate change. The nominated property is located in the central-southwestern Chinese part of the *Abies* distribution range, and guarantees this as an important research site for palaeoclimatology, paleobotany and geology etc. *Abies fanjingshanensis* forest has a very simple and non-stable community structure, which is vulnerable to natural hazards and needs to be preserved as well as the residential habitat.

Fanjingshan is a prime refuge and globally precious gene bank for *Fagus* forest

Fagus (beech) used to have wide distribution in the northern hemisphere during the Tertiary period, while it now distributed discontinuously in Europe, Northern America and eastern Asia. In China, *Fagus* is mainly distributed in subtropical mountains, including *Fagus hayatae*, *Fagus longipetiolata*, *Fagus lucida* and *Fagus engleriana*, and Fanjingshan uniquely has three of these species, including *Fagus longipetiolata*, *Fagus lucida* and *Fagus engleriana*. It is rare in the world that a large area and contiguous virgin forest is formed mainly with three *Fagus* species, and the nominated property represents an important global refuge of *Fagus*. The four species of *Fagus* in China have separate communities and distributions, such as *Fagus hayatae* which is distributes in Yushan and Lalashan; *Fagus longipetiolata* distributed in Maoershan and Michangshan; *Fagus engleriana* distributed in Dabashan and Tianmushan; *Fagus lucida* distributed in Fanjingshan, Badagongshan and Kuankuoshui. Fanjingshan concentrates *Fagus longipetiolata*, *Fagus lucida* and *Fagus engleriana*, and their genes, which indicates Fanjingshan as among the most important *Fagus* gene banks, remarkably valuable for scientific research and species conservation.

Fanjingshan is an ideal refuge for ancient relict flora, and an important habitat for differentiation and development of many endemic species.

Benefiting from its particular geographical location, Fanjingshan was little influenced by Quaternary Glaciation and maintained a stable modern geological environment and appropriate climate, and remains an ideal refuge for ancient relict flora, many of which are preserved and continue to develop here. According to research data, the nominated area has no less than 36 species of ancient relict gymnosperms, such as *Abies fanjingshanensis*, *Taxus mairei*, *Tsuga longibracteata*, etc. In total there are 101 families and 335 genus of ancient relict flora surviving since before the Quaternary, which accounts for 60.12% of the spermatophyte families and 55.11% of spermatophyte genera, including 64 families and 174 genera of ancient relict flora surviving from before the Tertiary Period, such as *Equisetaceae*, *Pinaceae*, *Cercidiphyllum*, *Hamamelidaceae*, etc. In addition, Fanjingshan spermatophyte flora is rich in monotypic and oligotypic flora, including 6 monotypic families, 43 monotypic genera and 111 oligotypic genera, giving the site a very high irreplacability value.

There are 345 species of rare and endangered wild animals and plants inhabiting Fanjingshan, including 230 species of rare and endangered wild plants such as *Abies fanjingshanensis*, *Davidia involucrata*, *Bretschneidera sinensis*, etc., and 115 species of rare or endangered wild fauna such as *Rhinopithecus brelichi*, *Manis pentadactyla*, *Capricornis milneedwardsii*, *Andrias davidianus*, etc., of which 102 species are listed on the IUCN Red List, 133 species are listed on CITES, 91 species listed on China's Lists of National Protected Wildlife, and 275 species are listed on the China Species Red List. Moreover, Fanjingshan is recognized as one of the Global Endemic Bird Areas (EBA) and China's Important Bird Areas (IBA), in which the main preserved birds are threatened pheasants, including Elliot's, Reeves and spectacular Golden Pheasants and tragopans etc.

Due to the unique and isolated environment in Fanjingshan, not only ancient species such as *Abies fanjingshanensis*, *Rhinopithecus brelichi* are preserved, but also newer endemic species (or sub-species) have developed, especially the species in advanced evolutionary stages (such as *Primulaceae, Gesneriaceae, Asteraceae*). According to research findings, Fanjingshan has an extraordinary 1,300 species of endemic plants and animals, including 1,056 species of endemic plants (46 local endemic species and 1,010 species endemic to China), 249 species of endemic animals (4 species of vertebrates, 238 species of insects, 5 species of spiders, 2 species of Oligochaeta), respectively. In addition, there are 75 species of endemic bryophytes distributed in Fanjingshan, indicating its importance as a differentiation center for endemic bryophytes.

Fanjingshan is rich in overall biological resources

Fanjingshan is a biodiversity treasure house conserving very rich biodiversity in terms of its small area and containing a high proportion of endemic, endangered and precious medicinal species.

Biodiversity research in Fanjingshan started very late. Until the 1930's, some Chinese scientists including Ying Jiang, Huanyong Chen, Buqin Zhong, Qiyuan Jiao, Austrian scientist Handel-Mazzetti and American scientist Stowe had surveyed the Fanjingshan vegetation species. In the 1960s, Zhuopo Jian from the Institute of Botany (Chinese Academy of Sciences) had survey the vegetation, especially *Fagus* forest in detail. After the 1980's, many colleges and institutions conducted intensive research about the biological resources, which greatly improved our understanding of the richness of Fanjinghsan biological resources discovery in Fanjingshan.

At present, 7,161 wild species have been discovered in Fanjingshan, including 4,394 species of plant and 2,767 species of animal, among which there are 99 species of freshwater algae, 452 species of macrofungi, 119 species of lichen, 3,724 species of high plants (including 791 species of bryophyte, 349 species of pteridophyta, 36 species of Gymnospermae, 2,548 species of Angiospermae), 450 species of vertebrate, 2,076 species of insect, 215 species of arachnida, 26 species of Oligochaeta. These are very large numbers considering the relatively small area of the property.

The plants and vertebrate species in Fanjingshan per unit area are most abundant, especially for *Gymnospermae, Amphibia* and *Pisces.* Moreover, Fanjingshan is the type locality for 64 species of plant. Some horticultural plants originating from the nominated area are now widely introduced and cultivated, including *Davidia involucrata*, *Buxus sinica, Taxus chinensis*, *Liriodendron chinense*, *Magnolia*, etc. Furthermore, the medicinal plants here are extremely numerous. Since 2014, 2,086 species (varieties) of medical plants have been recorded, almost 1/4 of all known Chinese medical plants, including 171 species fungi, 22 species muscus, 244 species ferns and 1,625 species angiosperm, which have tremendous potential for wider development as medical resources. Meanwhile, the vegetation in Fanjingshan has great effects on soil and water conservation, regulating climate, providing clean water in all directions and underpinning social economic development.

3.1.c Statement of integrity

According to the requirements for integrity, protection and management in *the Operational Guidelines (2015) for the Implementation of the World Heritage Convention,*

the nominated property of Fanjingshan can fully meet the requirements of integrity.

- **The property includes all elements necessary to express its outstanding universal value**

The demarcation of the boundary of the nominated property and its buffer zone follows the following principles: 1) including all elements necessary to express the outstanding universal value of the nominated property; 2) be of adequate size to ensure the complete representation of the features and processes which convey the significance of the property (OUV); 3) in accordance with the topography and physical boundaries such as a mountain ridge, valley, river, forest line, topography unit, as much as catchment area to make the boundary easy to recognize and manage; 4) avoiding human activities that may affect the heritage value such as large town and quarry, etc.; 5) having protective designations to ensure the component parts have legal protective status; 6) be of adequate size to cover all the habitats of the endemic snub-nosed monkeys and other key species; and 7) the nominated property should be surrounded by a buffer zone that provides further buffer action and protection if necessary.

(1) Boundary of the nominated property

The boundary of the nominated property of Fanjingshan is between N27°45′07″-N28°02′42″ and E108°30′43″-E108°47′53″, and is defined to include the whole of the aesthetic importance, the forest ecosystem, and the spatial extent of the habitats of rare and endangered species.

- The nominated property is inside Fanjingshan and Yangxi Nature Reserves; the north boundary of the nominated property overlaps with the divide of upstream basin of Taipinghe river, which is also the boundary of Yinjiang and Songtao Counties. The north coordinate point is N28°02′42″, E108°45′25″.
- The eastern boundary starts from the Banpotai Village in Songtao County, running southward though Niujiaodong and then coincides with the intermediate protection zone boundary of Fanjingshan National Nature Reserve. Then it goes along the west of Taipinghe River through Lengjiaba to Kuaichang Village in Jiangkou County. The east coordinate point is N27°53′13″, E108°47′53″.
- The southern boundary extends southward and coincides with the boundary of the intermediate protection zone of Fanjingshan National Nature Reserve through Kuaichang Village and the confluence reaches of Macaohe River and Taipinghe River, passing though the upstream basin of Minxiaohe River in Gaofeng Village.

The boundary turns to north along the intermediate protection zone of Fanjingshan National Nature Reserve after reaching the south end, and arrives at Bamei Village in Dewang Town. The south coordinate point is N27°45′07″, E108°39′32″.

- The western boundary of the nominated property overlaps with the boundary of Fanjingshan National Nature Reserve and connects with the northern boundary of core zone of Yangxi Provincial Nature Reserve. After reaching Dianchang Village of Luochang Town, the boundary passes through Yuanjialin Village, Damianpo and Doucoulin in Ziwei Town and connects with the intermediate protection zone boundary of Fanjingshan National Nature Reserve again. The west coordinate point is N27°53′28″, E108°30′43″.

(2) Boundary of the buffer zone

A World Heritage buffer zone is defined as an area surrounding the nominated property which has complementary legal or customary restrictions on its use and development to give an added layer of protection to the property. Moreover, the buffer zone of the nominated property provides habitat connectivity for wildlife and improves the resilience for species occupying the nominated area. The boundary of the buffer zone is between N27°43′37″-N28°04′23″ and E108°29′42″ - E108°51′29″.

- The northern boundary of buffer zone starts from Hetaowan in Yinjiang County, goes along the ridges of the mountains, passes through Cajiahe River and Jinhe River to Fengyong village in Songtao County, then continues eastward to Sitang, and the north coordinate point is N28°04′23″, E108°46′48″.
- The eastern boundary goes along mountain ridges to south after passing through Sitang, and turns into Jiangkou County to the south of Suzhai village, and the east coordinate point is N27°52′23″, E108°51′29″.
- The southern boundary goes along the ridge line from Zhaisu village and crosses the Taipinghe River to the Bangou after passing through Zhangjiatun. The south coordinate point is N27°43′37″, E108°40′19″.
- The Western boundary overlaps with the boundary of Yangxi Nature Reserve, and goes along the ridge line of Jinhuding to Hetaowan after passing through Hejiaping, Zhoujiawan, Chayuantuo, Zuyuanba. The west coordinate point is N27°52′16″, E108°29′42″.

The property is of adequate size to ensure the complete representation of the features and processes which convey the property's significance

The nominated property covers an area of 40,275 ha and its buffer zone covers an area of 37,239 ha, respectively. There is of adequate size to ensure the complete representation of the features and processes which convey the property's significance including the integrity of the on-going ecological and biological processes, biological diversity and the aesthetic importance. As noted elsewhere, Fanjingshan acts as a virtual metamorphic island within a sea of karst. The boundaries reflect this naturally geologically bounded system that has and continue to function as a self-sustaining ecological unit. The scope of the nominated property also covers the natural ecological habitat of diversified biota in the area, including ancient rare animals and plants from the Tertiary and Quaternary 70 million years to 2 million years ago (Photo 3.2-3.3). Different habitats such as plant communities, cliffs, caves, slopes and water bodies provide the sites for biological evolution of wild species. Simultaneously, the nominated property not only contains the outstanding universal value of natural elements, but also the aesthetic importance of geomorphologic and ecological landscape features and phenomena exhibited in this area (Photo 3.4-3.8).

Photo 3.2 Guizhou Snub-nosed monkeys *Rhinopithecus brelichi*

Photo 3.3 Fanjingshan fir *Abies fanjingshanensis*

Photo 3.4 Charming Fanjingshan peaks

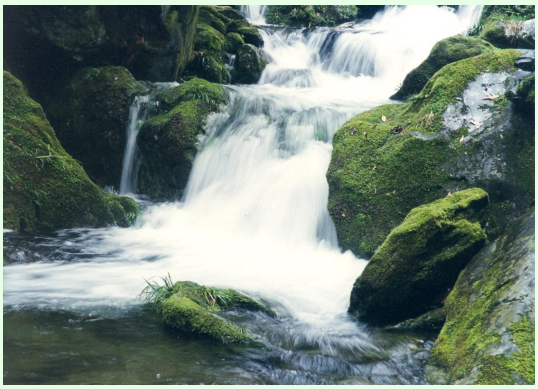


Photo 3.5 Waterfall on Heiwanhe

Photo 3.6 Autumn hues of Fanjingshan

Photo 3.7-3.8 Buddha's light of Fanjingshan

(1) Natural beauty and the landscape types

With the a huge dome mountain as the main landscape, many isolated peaks and the knife-edge ridges as representative landscape features, Fanjingshan has an intact mountain forest system and wonderful ecological environment. It is the combination of rolling mountains, steep gorges and layered features that contribute to the magnificent landscapes of Fanjingshan.

Photo 3.9 Winter of Fanjingshan

(2) The ecological island character of the mountain ecosystem in the nominated property

The comparison of landscape, vegetation and landform between the nominated property and surrounding karst confirms the ecological island character of the mountain ecosystem. The area's main ecological elements are totally included within the nominated property, such as the topographically prominent metamorphic rocks acting as a geomorphological matrix which is surrounded by karst landform; primary forest which is dominated by evergreen broad-leaved forest and mixed evergreen and deciduous broad-leaved forest; soil and climate vertical zonation; mirrored vegetation vertical zonation, ongoing marsh vegetation evolution; the transitional flora; ancient relic flora; and the evidential links between vegetation evolution, geomorphology and climate change.

(3) The key elements of rare and endangered species habitats in the nominated property

The nominated area is the only habitat of the Guizhou snub-nosed monkey *Rhinopithecus brelichi* (Photo 3.10). Snub-nosed monkeys have regular seasonal migrating patterns within the property, and regularly gather at Yangaoping each year from April to May and September to October. Recent monitoring reveals that besides the main active area, there are now several separated small *Rhinopithecus brelichi* groups consisting of 2-3, 5-8 or about 10 individuals. Thus, the nominated property expanding to the north and west parts provides an assured habitat covering all of the *Rhinopithecus brelichi* activity area, and will benefit the conservation of this keystone species.

The nominated area is also the only habitat of the Fanjingshan fir (*Abies fanjingshanensis*) (Photo 3.11). The distribution of *Abies fanjingshanensis* is concentrated to the central area of the nominated area.

The nominated area contains the largest area of beech forest (*Fagus*) in Asia (Photo 3.12), in which *Fagus* is the key edificator. Moreover, *Fagus* forest provides the feeding, hiding and breeding place for snub-nosed monkeys. In addition, there are plenty of other dependent rare or endangered plant species including *Abies fanjingshanensis*, *Davidia involucrata*, *Bretschneidera sinensis*, *Taxus chinensis*, *Liriodendron Chinense*, *Eurycorymbus cavaleriei*, *Kurzia sinensis*, *Stahlianthus involucratus*, *Paphiopedilum micranthum*, *Corybas fanjingshanensis*, *Diospyros fanjingshanica*, etc.

The nominated area contains essential habitat types for rare or engendered and endemic species, including forests, river, cave, precipice, brush land and meadow, in which rare or engendered and endemic animals inhabit, including *Rhinopithecus brelichi,*

Macaca thibetana, Macaca mulatta, Manis pentadactyla, Panthera pardus, Neofelis nebulosa, Ursus thibetanus, Capricornis milneedwardsii, Naemorhedus goral, Moschus berezovskii, Muntiacus reevesi jiangkouensis, Syrmaticus ellioti, Syrmaticus reevesii, Aix galericulata, Andrias davidianus, Leptobrachium boringii, Megophrys binlingensis fanjingmontis, Carabus fanjingshanensis.

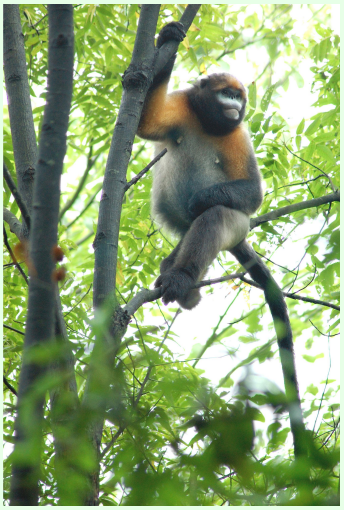


Photo 3.10 Guizhou Snub-nosed monkey *Rhinopithecus brelichi*

Photo 3.11 Fanjingshan fir *Abies fanjingshanensis*

- **The property is well managed to counter negative impacts of adjacent development**

The nominated property is affected or threatened to some extent by impacts of tourism development, and the buffer zone and surrounding areas are affected or threatened by agriculture, tourism development and by some geologic hazards such as landslides. However, with effective measures taken by the relevant administrative agencies to reduce the negative influences, the influence scope and intensity of these threats is limited and has little influence on the Outstanding Universal Value maintaining the exceptional natural state of the property.

The nominated property and part of the buffer zone all enjoy protective legal designations. In the nominated property, Fanjingshan National Nature Reserve was approved by the State Council as one of the first seventeen national nature reserves in 1986, and admitted to be a member of the UNESCO Man and Biosphere Reserve Network. Yangxi Wildlife Nature Reserve was gazetted in 2000, and was upgraded to be a provincial nature reserve in 2016. In the buffer zone, the eastern part starting from Hetaoping and going southward along Taipinghe belongs to Fanjingshan-Taipinghe Provincial Park, and north Jinchang Village in the northern buffer zone belongs to

Photo 3.12 Fagus (Beech) forest

Muhuang Provincial Park. Thus the above regions are all protected by national laws and regulations. They also have stable financial resources.

3.1.d Protection and management requirements

(1) Legal Framework for protection and management

Land in the nominated property belongs to the State and all parts are protected areas such as National Nature Reserve and UNESCO Man and Biosphere Reserve Network. They are protected by wide variety of long term and complementary local and national related laws and regulations which are detailed in section 5.b.2.

A multi-level management system, from the national level to the local level, has been established to manage the nominated property. In addition, a co-operative system involving various sectors of the government, technology institutions, research institutions and local communities, has been set up. All of these organizations have sufficient funds and staff to fulfill their responsibilities. The property will further improve the internal management mechanism from now on and strengthen the establishment of a cooperative management system of Fanjingshan National Nature Reserve. Each management department has its own duty and responsibility and cooperates with each other to ensure that protection and management is carried out in a good and coordinated order. At the same time, the unique and long Buddhism Culture of Fanjingshan shapes the belief systems and its environment for indigenous people, ensuring that agreements are reached with folk groups to protect its nature in everyday life. Therefore, a more complete top-down protection management system for heritage has been built in Fanjingshan. All local communities are aware of the nomination of the World Heritage, and all stakeholders support the World Heritage inscription, which would positively contribute to the long-term management of their heritage.

The relevant administrations of the nominated property has prepared relevant plans, such as *Master Plan on Guizhou Fanjingshan National Nature Reserve (2014-2023), The Master Plan of the Guizhou Yinjiang Yangxi Provincial Nature Reserve (2015-2024), The Master Plan of Eco-tourism Development of the Guizhou Fanjingshan National Nature Reserve (2014-2023), Conservation Plan on the World's Only Son Rhinopithecus brelichi (2015-2025),* etc. In order to aim at the protection of the potential outstanding universal value for the nominated property better, *Fanjingshan Management Plan* (2016-2030) as the comprehensive plan for protection and management has been compiled. Working with other planning instruments an overall management framework was been built to ensure that the Outstanding Universal Value of Fanjingshan is well protected and preserved. These plans all put forward feasible measures to address the challenges of conserving this outstanding site, the habitat of *Rhinopithecus brelichi*,

integrity of forest ecosystems, participative management of surrounding communities and sustainable development of the tourism industry.

(2) Long-term challenges for the protection and management of the property

Currently, the challenges for the protection and management of the nominated property include the following aspects: narrow distribution range, small population and slow growth of *Rhinopithecus brelichi*; the ecosystem impact arising from unreasonable lifestyle practices of a few local community residents which may affect the ecosystem of the nominated property; the development of the tourism industry has brought a certain pressure on the natural resources and ecological environment. Mining activities in the northwest buffer zone have been curtailed and closed down.

As noted above an effective system of planning guided by the comprehensive *Fanjingshan Management Plan* will ensure that the threats noted above are monitored and that appropriate management measures are implemented to mitigate any adverse impacts.

3.2 Comparative analysis

3.2.a The uniqueness of the nominated property

The domal metamorphic rock mountain – the nominated property of Fanjingshan, which is surrounded by a karst 'sea', lies in the mid subtropical zone. As a relatively independent and complete mountainous ecological system, Fanjingshan is similar to an ecological island since it contains unique natural phenomena and ecological processes, protects the largest subtropical *Fagus* forest in area as well as the largest in population and rarest subalpine mountainous fir forest, and preserves the only habitat and shelter for endangered species of Guizhou Snub-nosed monkey. The unique ecosystem and landscapes of Fanjingshan form an outstanding example of global climate change processes, having outstanding global significance.

Criterion (vii): Uplifted from low karst hills, this high mountain is like a precious emerald gemstone inlaid in a young karst crown in south China. With landscape features such as high steep mountains, rocks, precipices, winding rivers, swamps, caves, valleys, virgin forests, attractive plants and animals and mysterious constantly changing meteorology, Fanjingshan displays a unique wealth of natural phenomena and comprehensive features as one of the world's most exceptional mountain landscapes. In addition to the geophysical expression of aesthetic values the biodiversity itself is full of beauty and wonder.

Criterion (ix): The oldest stratum and marine life of Fanjingshan record the evolution history 1,000-1,400 Ma ago. A large number of ancient and relict species such as *Abies fanjingshanensis, Fagus longipetiolata, Davidia involucrata, Liriodendron chinense* and *Rhinopithecus brelichi* record the history of the global environmental changes since the Tertiary Period. Mountain climate, vegetation and vertical soil stripes, and the ancient sporopollen records show that the uplift process of Fanjingshan. Multiple subalpine swamps and their existing vegetation succession outstandingly exhibit the ongoing ecological processes of Fanjingshan since the Holocene; especially the heavy uplifting of mountain caused environmental change and subsequently exacerbated the divergent evolution, and finally promoted the formation process of new species (and varieties). Concentrated and contiguous and large in area existence of *Fagus* forest is a significant factor of the sustainable survival and development of *Rhinopithecus brelichi*. Tree cores of up to 1,000 years old have recorded recent climate changes whilst the modern monitoring of weather, vegetation and wildlife have documented the continuing evolution and adaptation of the ecosystem to recent anthropogenic climate change and other human impacts.

Criterion (x): Fanjingshan is a concentrated distribution region for endemic species and the differentiation center of a large number of species under the 'ecological island' and mountainous habitat heterogeneity effects. Fanjingshan possesses rare plants as well as ancient and relict plants, containing the largest area of beech forest in subtropical zone and evergreen *Fagus* forest, the most rare subtropical subalpine fir forest, and it is the only distribution of *Abies fanjingshanensis;* it provides the entire global distribution of the rare and endangered Guizhou Snub-nosed Monkey *Rhinopithecus brelichi, a*nd provides an important habitat for other rare animals such as *Panthera pardus, Neofelis nebulosa*, *Moschus berezovskii*, *Capricornis milneedwardsii*, *Syrmaticus ellioti* and *Andrias davidianus* etc. The nominated property is an important distribution region of bryophytes and one of the most significant differentiation centers for endemic bryophytes in China.

Fanjingshan is situated in the Oriental Deciduous Forest biogeographic biome in the palaearctic, and it is a class A protection area of global significance included in Man and Biosphere Network (MAB); It is one of Terrestrial Global 200 Priority Ecoregion (Southeast China-Hainan Moist Forests, G200_NUM: 23) and the Yangtze River and Lake Region in Freshwater Global 200 Priority Ecoregion (Yangtze River & Lake, G200_NUM: 149), Chinese subtropical forest zones (No.140) and Chinese southeastern mountains (No.141) of Endemic Bird Area (EBA), Important Bird Areas in China (A1: globally threatened species, A2: restricted range species, A3: biological community

restricted species) and national Nature Reserve. The main protection objects contained in this subtropical forest ecosystem are rare animals and plants such as *Rhinopithecus brelichi*, *Abies fanjingshanensis*, *Fagus longipetiolata*, *Davidia involucrata*, *Syrmaticus ellioti* and *Syrmaticus reevesii*. The nominated area is a famous religious mountain which was protected very well in history. Its natural system keeps its original condition; the ecological system remains well integrated and has high biodiversity. It has the significant values of aesthetics, ecological process and biological diversity.

According the *Operational Guidelines (2015) for the Implementation of the World Heritage Convention*, the nominated property should be compared with other similar properties and/or nominated properties. Since Fanjingshan is nominated for criteria (vii), (ix) and (x), combining with its ecosystem characteristics, relevant sites are chosen to compare with Fanjingshan.

Until July 2016, the total number of world natural heritages is 203, and that of mix heritages is 35 (UNESCO, 2016), among which 55 are indexed for criterion (vii). According to the similarity of landscapes, properties abroad such as Iguazu National Park, Sangay National Park, Talamanca Range-La Amistad Reserves / La Amistad National Park, Rwenzori Mountains National Park, Mount Kinabalu and such domestic properties as Taishan, Huangshan, Lushan, Sanqingshan and Wulingyuan are chosen to compare with Fanjingshan which is mountainous forest landscape.

Because Fanjingshan is similar to an isolated mountainous ecosystem island, properties and nominations belonging to three ecosystem ypes, classical island, similar island (like coastal mountains) and inland mountains, are chosen to do the comparison. Because of the typicality and integrity of the vertical vegetation spectrum of Fanjingshan, properties and nominations in and properties and non-properties nearby the biogeographic province Fanjingshan belongs to it, are chosen to do the comparison on vertical vegetation spectrums.

Nine world heritage properties and six nominations are in the same biogeographic province with Fanjingshan, and the vegetation and ecosystem features of them are similar. Shirakami-Sanchi are inscribed on criterion (ix), Mount Emei on (x), Huangshan, Shudao, Xueyueshan and Jingangshan on (vii) and (x), Shennongjia on (ix) and (x), so that they are chosen to do biodiversity comparison with Fanjingshan. In Nearby biogeographic province - Chinese subtropical forest province, Mount Wuyi world heritage property and Mount Jinggang-Wuyi nomination with the similar the latitudes to Fanjingshan, and Dinghushan National Natural Reserve located in south subtropics are

chosen to do comparison analysis. There are important rare and endangered species, key species recording global climate change and ecosystem function such as *Rhinopithecus brelichi*, *Abies fanjingshanensis* and *Fagus* and quite diverse mosses, so that *Rhinopithecus brelichi* in Fanjingshan is compared with *Rhinopithecus roxellanae*, *Rhinopithecus bieti*, *Rhinopithecus avunculus* and *Rhinopithecus strykeri*, *Abies fanjingshanensis* is compared with other subtropical firs: *Abies beshanzuensis*, *Abies ziyuanensis*, *Abies yuanbaoshanensis* and *Abies chensiensis,* fagus forest in Fanjingshan is compared with other global classical *Fagus* forests: *Fagus sylvatica* forest in Uholka–Shyrokyi Luh, Hainich and Serrahn properties, *Fagus crenata* and *Fagus japonica* forests in Shirakami-Sanchi property, moss flora of Fanjingshan is compared with other moss-rich areas such as Hengduanshan, Qinling and Huangshan, etc.

Fanjingshan nominated property is adjacent with Shennongjia property. Fanjingshan is located in the centre of mid subtropics while Shennongjia in the north subtropics, in addition, they are both located in the oriental deciduous forest biogeography province in Palaearctic. Therefore, Fanjingshan is compared with Shennongjia in detail of all the elements.

3.2.b Comparative analysis based on the criterion (vii)

3.2.b.1 Comparative analysis with mountain landscape heritage

By the year 2016, there are 1,052 world heritage sites in the world, belonging to 174 state parties (UNESCO World Heritage Centre, 2016), including 203 natural sites and 35 mixed sites. Criterion vii is one of the most commonly applied criteria in the nomination and inscription of these natural and mixed World Heritage sites and yet it is one of the most subjective and difficult criteria to evaluate. IUCN 2013 has published a study of how to better apply this criterion. These guidelines distinguish between superlative natural phenomena that can be readily and objectively measured and judged such as the tallest, deepest, oldest, longest features of a given type and the less measurable attributes of exceptional natural beauty and aesthetic importance. Moreover, other natural criteria are largely regional in nature and comparisons need be made only with tropical forest to tropical forest or alpine lake to alpine lake, scenic beauty is essentially global and must be lined up for comparison against the entire list of sites under the same criterion. IUCN present a table of 133 (see Appendix 8 of that report) such sites already recognized under criterion vii and there must be many more on tentative lists or having potential for listing and recognition.

Examination of the list of the 133 sites allows a certain level of analysis that indicates a clear appreciation for such recurring attributes as water bodies, forested mountains and great vistas or great aggregations of living creatures or rare natural features. The guidelines also describe various national and international attempts to define scenic qualities in UK, Japan, India, Arab States etc. But at the end of the day such appreciation is still subjective and also prone to regional, cultural and fashionable preferences.

The attributes of the outstanding aesthetic values of Fanjingshan are not of the superlative nature. We do not claim the biggest or largest of any particular feature, but they aggregate into a rare concentration of separate delights that we feel stand up to comparison with any other sites on the planet. We would list especially the following attributes:

Wildness: The freedom of water to flow its own course, tumble in crazy abandon, the savagery of nature all around, the jagged harshness of rocks and pinnacles, trees clinging impossibly to vertical cliffs

Naturalness: In all directions and on and on all is natural, green and so full of life among the vast forests.

Water attributes: The waters of life so diversely displayed all around as rain, fog, streams, mighty rivers, gentle ponds, dramatic slender waterfalls, rainbows etc. - all in crystal purity.

Mountain grandeur: Gentle peaks, jagged peaks, cliffs and gorges but everywhere very 3 dimensional complexes and pleasing. The flat lying rock is obvious, Mushroom Rock, Rolls of Book Rock, the Eagle rock etc. are symbolic landscapes, which are different from the other jagged peak sites. These formations are frequently displayed in national advertisements.

Tranquility of proportions: The scenery so matches the ideals of European Arcadia or the perfect Chinese landscape painting as to form the basis for artistic copy, the layout and rock and water features of oriental gardens and the perfect locality for pilgrims and artists through the ages.

Scale of landscape and features: The vastness of space and vistas, dwarfing mankind and all his structures, features presented in pleasing proportions, gentle curves to jagged wildness.

Wonder and Mystery of rock and cloud forms: Rocks that resemble people and animals, clouds that resemble the sea, strange effects of mountain sunlight and shadows

eternally changing.

Awe of the power of natural forces: Vertical rock fissures and towers, dramatic gorges, plunging waterfalls, carving through rock, all are astonishing and inspire visitors by the natural forces of earth movement, the water erosion and the wind erosion etc.

Delight in variety: Among the mountains and fragment landform, every twist and turn brings the delight of unexpected forms of landscape, rocks, tree shapes and wildlife

Forests extent, form and texture: The abundant forest are tall and upright, or lush and shading, or low and tangled among the mountains, when the clear wind whipps, we could be touched, and our primative love of forests is stimulated by endless views of trees, branches, leafy textures and colours.

Colour palette: With the seasonal changes, Fanjingshan is like a huge natural palette of matching hues. The forests are so glorious with the light green, subtle greens, the art of a million flowers, autumnal reds and yellows, massed ranks of rhododendrons etc.

Massing of life: Great collections of matching butterflies always drink at forest pools, flocks of swifts nesting among the stone pillars, mass flowering of rhododendrons.

Popularity: Since the introduction of Buddhist in Tang dynasty, many pilgrims have visited Fanjingshan by foot journey, and now about 400,000 visitors each year come long distances and pay high fees to enjoy and witness such beauty.

Inspirational: Fanjingshan is not just the local people's holy place but spiritual heritage for the whole China. The great legacy of such inspired works records its prestige and position. Early as 16th, the king of Ming dynasty wrote a *preface for a reward rebuilding the Jinding temple of Fanjingshan*, which said it was a Buddhist monastery and was one of the great cultural mountains of China. In history, there were once 60 temples and remain hundreds of relics, such as poetries, inscriptions, ruins, and cliff steles, plaques in Fanjingshan, which record the poets' emotion, the monks' activities, the government's conservation, and the social morality for building the temples, bridges, and roads.

It is impossible to objectively judge these features against the 133 other sites listed under criterion vii on the WH list or countless other recognized scenic wonders across the globe, but there are few other sites that offer so many such features and such a concentration of scenic diversity and delight. Using a rating for 10 recurring categories of scenic values (L = beautiful lakes; W = spectacular waterfalls; C = exceptional coastline; P = wonderful panorama; G = spectacular geology/landform; D = desert; M = scenic mountains; F = outstanding forests; Me = unusual meteorological phenomena; Wi = wildlife spectacle).

Table 3.2 List of 143 properties inscribed on the basis of criterion (vii)

No.	Property name	State Party	Date inscribed	Type of site	Criteria	Region	Category of scenic value
1400	Lakes of Ounianga	Chad	2012	Natural	(vii)	Africa	L,P,D,
1386	Rock Islands Southern Lagoon	Palau	2012	Mixed	(iii)(v)(vii)(ix)(x)	Asia&Pacific	C,L,P,G
1369	Ningaloo Coast	Australia	2011	Natural	(vii)(x)	Asia&Pacific	C,P,G, Wi
1377	Wadi Rum Protected Area	Jordan	2011	Mixed	(iii)(v)(vii)	Arab States	D,M,P,G,
1060	Kenya Lake System in the Great Rift Valley	Kenya	2011	Natural	(vii)(ix)(x)	Africa	P,L,G,Wi
1335	China Danxia	China	2010	Natural	(vii)(viii)	Asia&Pacific	G,W,P,M
1317	Pitons, cirques and ramparts of Reunion Island	France	2010	Natural	(vii)(x)	Europe&N America	C,G,P,F
1325	Phoenix Islands Protected Area	Kiribati	2010	Natural	(vii)(ix)	Asia&Pacific	C,G,P,Wi
1234	Putorana Plateau	Russian Federation	2010	Natural	(vii)(ix)	Europe&N America	P,G,F,
1237	The Dolomites	Italy	2009	Natural	(vii)(viii)	Europe&N America	M,L,G,P,
1292	Mount Sanqingshan National Park	China	2008	Natural	(vii)	Asia&Pacific	M,F,G,
1115	Lagoons of New Caledonia: Reef Diversity and Associated Ecosystems	France	2008	Natural	(vii)(ix)(x)	Europe&N America	L,C,Wi
1290	Monarch Butterfly Biosphere Reserve	Mexico	2008	Natural	(vii)	Latin America& Caribbean	F,Wi
1248	South China Karst	China	2007	Natural	(vii)(viii)	Asia&Pacific	G,M,W,P
1264	Jeju Volcanic Island and Lava Tubes	Korea, Republic of	2007	Natural	(vii)(viii)	Asia&Pacific	G,M,P,C
1258	Teide National Park	Spain	2007	Natural	(vii)(viii)	Europe&N America	M,G,Me,P
1216	Malpelo Fauna and Flora Sanctuary	Colombia	2006	Natural	(vii)(ix)	Latin America& Caribbean	C,Wi,P
1182	Islands and Protected Areas of the Gulf of California	Mexico	2005	Natural	(vii)(ix)(x)	Latin America& Caribbean	C,P,G,D,Wi
1195	West Norwegian Fjords – Geirangerfjord and Nærøyfjord	Norway	2005	Natural	(vii)(viii)	Europe&N America	L,C,M,F,P
1149	Ilulissat Icefjord	Denmark	2004	Natural	(vii)(viii)	Europe&N America	G,P,C
1167	Tropical Rainforest Heritage of Sumatra	Indonesia	2004	Natural	(vii)(ix)(x)	Asia&Pacific	M,F,P
1161	Pitons Management Area	Saint Lucia	2004	Natural	(vii)(viii)	Latin America& Caribbean	M,P,G
1094	Purnululu National Park	Australia	2003	Natural	(vii)(viii)	Asia&Pacific	G,W,P
1083	Three Parallel Rivers of Yunnan Protected Areas	China	2003	Natural	(vii)(viii)(ix) (x)	Asia&Pacific	P,L,M,F,G,Wi

1000	Brazilian Atlantic Islands (etc)	Brazil	2001	Natural	(vii)(ix)(x)	Latin America & Caribbean	C,P,G
1037	Swiss Alps Jungfrau-Aletsch	Switzerland	2001	Natural	(vii)(viii)(ix)	Europe&N America	M,G,P
999	Pantanal Conservation Area	Brazil	2000	Natural	(vii)(ix)(x)	Latin America and the Caribbean	F,Wi,P
1013	Gunung Mulu National Park	Malaysia	2000	Natural	(vii)(viii)(ix)(x)	Asia&Pacific	M,P,F,W,Wi
985	uKhahlamba/ Drakensberg Park	South Africa	2000	Mixed	(i)(iii)(vii)(x)	Africa	M,P,G,W,F
893	Atlantic Forest South-East Reserves	Brazil	1999	Natural	(vii)(ix)(x)	Latin America and the Caribbean	M,F,P
911	Mount Wuyi	China	1999	Mixed	(iii)(vi)(vii)(x)	Asia&Pacific	W,P,G,M,F,Me,Wi
889	Desembarco del Granma National Park	Cuba	1999	Natural	(vii)(viii)	Latin America and the Caribbean	M,Wi,P
652	Puerto-Princesa Subterranean River Nat. Park	Philippines	1999	Natural	(vii)(x)	Asia&Pacific	C,G,P,F
914	iSimangaliso Wetland Park	South Africa	1999	Natural	(vii)(ix)(x)	Africa	F,Wi,L,P,Me,C
629	Macquarie Island	Australia	1997	Natural	(vii)(viii)	Asia&Pacific	C,P,G,Wi,
800	Mount Kenya National Park/Natural Forest	Kenya	1997	Natural	(vii)(ix)	Africa	M,G,Me,F,Wi,P
773	Pyrénées - Mont Perdu	Spain, France	1997	Mixed	(iii)(iv)(v)(vii)(viii)	Europe&N America	M,G,P,
764	Belize Barrier Reef Reserve System	Belize	1996	Natural	(vii)(ix)(x)	Latin America and the Caribbean	C,Wi,G
754	Lake Baikal	Russian Federation	1996	Natural	(vii)(viii)(ix)(x)	Europe&N America	M,L,G,F,P
765	Volcanoes of Kamchatka	Russian Federation	1996	Natural	(vii)(viii)(ix)(x)	Europe&N America	M,G,F,P
774	Laponian Area	Sweden	1996	Mixed	(iii)(v)(vii)(viii)(ix)	Europe&N America	M,P,Wi,G
719	Virgin Komi Forests	Russian Federation	1995	Natural	(vii)(ix)	Europe&N America	F,G,L
740	Gough and Inaccessible Islands	United Kingdom	1995	Natural	(vii)(x)	Europe&N America	C,G,P
721	Carlsbad Caverns National Park	United States of America	1995	Natural	(vii)(viii)	Europe& N America	G,P
354	Waterton Glacier International Peace Park	USA & Canada	1995	Natural	(vii)(ix)	Europe&N America	M,P,G
685	Doñana National Park	Spain	1994	Natural	(vii)(ix)(x)	Europe&N America	L,C,P,Wi
682	Bwindi Impenetrable National Park	Uganda	1994	Natural	(vii)(x)	Africa	F,P, Wi

684	Rwenzori Mountains National Park	Uganda	1994	Natural	(vii)(x)	Africa	M,G,F,P
701	Canaima National Park	Venezuela (Bolivarian Republic of)	1994	Natural	(vii)(viii)(ix)(x)	Latin America&Caribbean	G,M,W
672	Ha Long Bay	Viet Nam	1994	Natural	(vii)(viii)	Asia&Pacific	C,G,P,
662	Yakushima	Japan	1993	Natural	(vii)(ix)	Asia&Pacific	C,M,F
653	Tubbataha Reefs Natural Park	Philippines	1993	Natural	(vii)(ix)(x)	Asia&Pacific	C,G,P,Wi
630	Fraser Island	Australia	1992	Natural	(vii)(viii)(ix)	Asia&Pacific	C,G,P,Wi
638	Huanglong Scenic and Historic Interest Area	China	1992	Natural	(vii)	Asia&Pacific	M,P,F,G
637	Jiuzhaigou Valley Scenic and Historic Interest Area	China	1992	Natural	(vii)	Asia&Pacific	M,P,F,G
640	Wulingyuan Scenic and Historic Interest Area	China	1992	Natural	(vii)	Asia&Pacific	W,P,G,Me,Wi,M,F
578	Shark Bay, Western Australia	Australia	1991	Natural	(vii)(viii)(ix) (x)	Asia&Pacific	C,P,G,Wi
609	Komodo National Park	Indonesia	1991	Natural	(vii)(x)	Asia&Pacific	C,M,Wi
608	Ujung Kulon National Park	Indonesia	1991	Natural	(vii)(x)	Asia&Pacific	C,M,F,Wi
573	Air and Ténéré Natural Reserves	Niger	1991	Natural	(vii)(ix)(x)	Africa	L,Wi,G,P
588	Danube Delta	Romania	1991	Natural	(vii)(x)	Europe&N America	C,P,Wi,L
591	Thungyai-Huai Kha Khaeng Wildlife Sanctuaries	Thailand	1991	Natural	(vii)(ix)(x)	Asia&Pacific	M,F,P,G
547	Mount Huangshan	China	1990	Mixed	(ii)(vii)(x)	Asia&Pacific	M, P,G,W
494	Tsingy de Bemaraha Strict Nature Reserve	Mada-gascar	1990	Natural	(vii)(x)	Africa	G,F,M
551	Te Wahipounamu– South West New Zealand	New Zealand	1990	Natural	(vii)(viii)(ix) (x)	Asia&Pacific	P,M,F,C,L
421	Tongariro National Park	New Zealand	1990	Mixed	(vi)(vii)(viii)	Asia&Pacific	M,Wi,G
548	Río Abiseo National Park	Peru	1990	Mixed	(iii)(vii)(ix)(x)	Latin America& Caribbean	F,Wi,P
516	Cliff of Bandiagara (Land of the Dogons)	Mali	1989	Mixed	(v)(vii)	Africa	G,P
509	Mosi-oa-Tunya / Victoria Falls	Zambia, Zimbabwe	1989	Natural	(vii)(viii)	Africa	W,F,G
486	Wet Tropics of Queensland	Australia	1988	Natural	(vii)(viii)(ix) (x)	Asia&Pacific	F,W,L,G,C,P
455	Meteora	Greece	1988	Mixed	(i)(ii)(iv)(v)(vii)	Europe&N America	M,G,F
454	Mount Athos	Greece	1988	Mixed	(i)(ii)(iv)(v)(vi)(vii)	Europe&N America	F,M,Wi
335	Nanda Devi and Valley of Flowers National Parks	India	1988	Natural	(vii)(x)	Asia&Pacific	M,G,Wi
485	Hierapolis-Pamukkale	Turkey	1988	Mixed	(iii)(iv)(vii)	Europe&N America	G,W,P

487	Henderson Island	United Kingdom	1988	Natural	(vii)(x)	Europe&N America	G,Wi,C
447	Uluru-Kata Tjuta National Park	Australia	1987	Mixed	(v)(vi)(vii)(viii)	Asia&Pacific	G,D,Wi
419	Gros Morne National Park	Canada	1987	Natural	(vii)(viii)	Europe&N America	G,L,Wi
437	Mount Taishan	China	1987	Mixed	(i)(ii)(iii)(iv)(v)(vi)(vii)	Asia&Pacific	M, G
410	Sian Ka'an	Mexico	1987	Natural	(vii)(x)	Latin America & Caribbean	F,Wi,C
403	Kilimanjaro National Park	Tanzania, United Republic of	1987	Natural	(vii)	Africa	G,F,M,Wi
355	Iguaçu National Park	Brazil	1986	Natural	(vii)(x)	Latin America & Caribbean	W,Wi,Me
390	Škocjan Caves	Slovenia	1986	Natural	(vii)(viii)	Europe&N America	G,P,L,M
380	Garajonay National Park	Spain	1986	Natural	(vii)(ix)	Europe&N America	F,G,Wi
369	Giant's Causeway and Causeway Coast	United Kingdom	1986	Natural	(vii)(viii)	Europe&N America	G,M
387	St Kilda	United Kingdom	1986	Mixed	(iii)(v)(vii)(ix)(x)	Europe&N America	C,P
338	Manas Wildlife Sanctuary	India	1985	Natural	(vii)(ix)(x)	Asia&Pacific	Wi,F,L,M,G
333	Huascarán National Park	Peru	1985	Natural	(vii)(viii)	Latin America and the Caribbean	M,L,Wi
357	Göreme National Park and the Rock Sites of Cappadocia	Turkey	1985	Mixed	(i)(iii)(v)(vii)	Europe&N America	G,P
303	Iguazu National Park	Argentina	1984	Natural	(vii)(x)	Latin America&Caribbean	W,F,L,Me
304	Canadian Rocky Mountain Parks	Canada	1984	Natural	(vii)(viii)	Europe&N America	M,L,W,G
280	Salonga National Park	DR Congo	1984	Natural	(vii)(ix)	Africa	F,P,Wi
289	Lake Malawi National Park	Malawi	1984	Natural	(vii)(ix)(x)	Africa	C,L,G
284	Chitwan National Park	Nepal	1984	Natural	(vii)(ix)(x)	Asia&Pacific	F,L,Wi
308	Yosemite National Park	USA	1984	Natural	(vii)(viii)	Europe&N America	W,F,L,Wi
302	Mana Pools National Park, Sapi and Chewore Safari Areas	Zimbabwe	1984	Natural	(vii)(ix)(x)	Africa	Wi,L
225	Pirin National Park	Bulgaria	1983	Natural	(vii)(viii)(ix)	Europe&N America	M,L,W,P
256	Wood Buffalo National Park	Canada	1983	Natural	(vii)(ix)(x)	Europe&N America	Wi,G,P
205	Talamanca Range-La Amistad Reserves / La Amistad National Park	Costa Rica, Panama	1983	Natural	(vii)(viii)(ix) (x)	Latin America& Caribbean	M,F,G,L,W

260	Sangay National Park	Ecuador	1983	Natural	(vii)(viii) (ix) (x)	Latin America& Caribbean	P,F,G
258	Gulf of Porto: Calanche of Piana, Gulf of Girolata, Scandola Reserve	France	1983	Natural	(vii)(viii) (x)	Europe&N America	Wi,C,G
274	Historic Sanctuary of Machu Picchu	Peru	1983	Mixed	(i)(iii)(vii) (ix)	Latin America& Caribbean	M,G,P
261	Vallée de Mai Nature Reserve	Seychelles	1983	Natural	(vii)(viii)(ix) (x)	Africa	F,C,Wi
259	Great Smoky Mountains National Park	USA	1983	Natural	(vii)(viii)(ix) (x)	Europe&N America	M,P,
179	Tassili n'Ajjer	Algeria	1982	Mixed	(i)(iii)(vii) (viii)	Arab States	G,D
186	Lord Howe Island Group	Australia	1982	Natural	(vii)(x)	Asia&Pacific	C,G,Wi
181	Tasmanian Wilderness	Australia	1982	Mixed	(iii)(iv)(vi) (vii)(viii) (ix)(x)	Asia&Pacific	G,F
195	Taï National Park	Côte d'Ivoire	1982	Natural	(vii)(x)	Africa	Wi,F
196	Río Plátano Biosphere Reserve	Honduras	1982	Natural	(vii)(viii) (ix)(x)	Latin America &Caribbean	C,Wi
185	Aldabra Atoll	Seychelles	1982	Natural	(vii)(ix)(x)	Africa	G,L,Wi
145	Los Glaciares	Argentina	1981	Natural	(vii)(viii)	Latin America & Caribbean	C,M,P
154	Great Barrier Reef	Australia	1981	Natural	(vii)(viii) (ix) (x)	Asia&Pacific	F,Wi,M
147	Kakadu National Park	Australia	1981	Mixed	(i)(vi)(vii) (ix)(x)	Asia&Pacific	G,Wi,M
159	Darien National Park	Panama	1981	Natural	(vii)(ix)(x)	Latin America & Caribbean	C,Wi,F
25	Djoudj National Bird Sanctuary	Senegal	1981	Natural	(vii)(x)	Africa	L,Wi
156	Serengeti National Park	Tanzania, United Republic of	1981	Natural	(vii)(x)	Africa	G,Wi
150	Mammoth Cave National Park	USA	1981	Natural	(vii)(viii) (x)	Europe&N America	G,P
151	Olympic National Park	USA	1981	Natural	(vii)(ix)	Europe&N America	F,M,P
136	Garamba National Park	DR Congo	1980	Natural	(vii)(x)	Africa	Wi,F
100	Durmitor National Park	Montenegr o	1980	Natural	(vii)(viii) (x)	Europe&N America	L,G,Wi
134	Redwood National and State Parks	United States of America	1980	Natural	(vii)(ix)	Europe&N America	M,F,C
71	Dinosaur Provincial Park	Canada	1979	Natural	(vii)(viii)	Europe&N America	G,L,P
72	Kluane / Wrangell-St Elias / Glacier Bay / Tatshenshini-Alsek	Canada,U nited States of America	1979	Natural	(vii)(viii) (ix) (x)	Europe&N America	C,P,M,G,Wi

98	Plitvice Lakes National Park	Croatia	1979	Natural	(vii)(viii)(ix)	Europe&N America	G,L,W,Wi
63	Virunga National Park	DR Congo	1979	Natural	(vii)(viii)(x)	Africa	M,G,P,Wi,L
120	Sagarmatha National Park	Nepal	1979	Natural	(vii)	Asia&Pacific	M,G,P,F
33	Belovezhskaya Pushcha / Białowieża Forest	Poland,Belarus	1979	Natural		Europe&N America	F,C,Wi
99	Natural and Cultural Heritage of the Ohrid region	Former Yugoslav Republic of Macedonia	1979	Mixed	(i)(iii)(iv)(vii)	Europe&N America	C
75	Grand Canyon National Park	USA	1979	Natural	(vii)(viii)(ix)(x)	Europe& N America	G,P,
24	Nahanni National Park	Canada	1978	Natural	(vii)(viii)	Europe&N America	W,G,L,F,D,M
1	Galápagos Islands	Ecuador	1978	Natural	(vii)(viii)(ix)(x)	Latin America& Caribbean	C,G,Wi
9	Simien National Park	Ethiopia	1978	Natural	(vii)(x)	Africa	M, P, Wi
39	Ngorongoro Conservation Area	Tanzania, United Republic of	1978	Mixed	(iv)(vii)(viii) (ix)(x)	Africa	M,P,Wi
28	Yellowstone National Park	USA	1978	Natural	(vii)(viii)(ix)(x)	Europe&N America	M,P,G,W,Wi

Comparative analysis conclusions

- Fanjingshan can claim OUV rating for 7 of these features, more than any other site on the list except for China's Wulingyuan, Mount Wuyi and Three Parallel Rivers World Heritage properties equally rated for 7, 7 and 6 categories respectively. The site is unusual in listing mysterious meteorological phenomena. Only 7 other sites make such a claim. It is recognized that whilst this analysis provides some quantitative comparative assessment of Fanjingshan's values against other sites the human response to nature is inevitably a subjective one and thus difficult to quantify with any accuracy.

- The real proof of course must be judged of people. These natural sites have been protected and praised consistently for centuries and continue to attract and satisfy the hundreds of thousands of paying visitors a year. They have proved to be the inspirational cradle for so much enduring philosophy and art.

3.2.b.2 Comparison with other Chinese famous mountain heritage site on aesthetic value

Table 3.3 Comparison with Chinese famous mountain sites on aesthetic value

No.	Sites	Criteria	Altitude-Longitude	Basic Information	Aesthetic Value
1	Fanjingshan (Tentative List Site, China)	(vii) (vi) (x)	N 27°53′ E 108°40′	Area: 77,763ha, the highest altitude is 2570 m; the altitude difference is 2,000m. All the streams and rivers are running radially from the top of the mountain, where has many waterfalls. It is a subtropical forest mountain landscape. Fanjingshan is a dome mountain and knife-edge-like ridge, which formed by the metamorphic rock and phyllite rock etc, the main landscapes are the column and peaks, such as Mushroom Rock, Rolls of Book Rock, etc.	Fanjingshan is a living and amazing subtropical forest mountain, formed by horizontal plane metamorphic rocks. The outstanding aesthetic value is enhanced by the abundant and beautiful flora and fauna, seasonal changing landscapes, and the three circle waterfalls, cloud formations, Buddha's Light etc.
2	Mount. Huangshan (World Heritage site, China)	(ii) (vii) (x)	N 30º10′ E118º11′	Area：65, 060ha, the highest altitude is 1,864m; the altitude difference is 1264m. Mount. Huangshan is the granite landform; the annual rainfall is 1,775.9mm. It is a subtropical forest mountain landscape Huangshan, known as 'the loveliest mountain of China', has for centuries been acclaimed through art and (e.g. the Shanshui 'mountain and water'). Today it holds the same fascination for visitors, poets, painters and photographers who come on pilgrimage to the site, which is renowned for its magnificent scenery made up of many granite peaks and rocks emerging out of a sea of clouds.	Mount Huangshan is renowned for its magnificent natural scenery which includes massive granitic boulders and ancient pine trees which are often further enhanced by cloud and mist effects. This dramatic landscape includes formations of natural stone pillars, grotesquely-shaped rocks, waterfalls, caves, lakes and hot springs, formed by its complex geological history.
3	Mount Sanqingshan National Park (World Heritage site, China)	(vii)	N28°48′-29°00′ E117°58′-118° 08′	The granite landform of Mount. Sanqingshan is22, 950ha, with highest altitude 1,817m, the altitude difference is 1,600m. Mount Sanqingshan National Park, a 22,950 ha site has been inscribed for its exceptional scenic quality, marked by the concentration of fantastically shaped pillars and peaks: 48 granite peaks and 89 granite pillars.	Superlative natural phenomena or natural beauty: Mount Sanqingshan's remarkable granite rock formations combine with diverse forest, near and distant vistas, and striking meteorological effects to create a landscape of exceptional scenic quality. The most notable aspect is the concentration of fantastically shaped pillars and peaks.
4	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (World Heritage site, China)	(iv)	N 29°32′ E103°46′	With area of 15, 400ha, and highest altitude is 3,099m and altitude difference is 2,649m, Mount. Emei is a basalt rock as the recognizable landscape. of subtropical forest mountain landscape., Mount Emei is notable for its exceptionally diverse vegetation, ranging from subtropical to subalpine pine forests. Some of the trees there are more than 1,000 years old.	Mount Emei is an area of striking scenic beauty. It is also of great spiritual and cultural importance because of its role in the introduction of Buddhism into China. The conscious siting of so many of the cultural monuments, particularly of traditional architecture, within the natural environment makes it a cultural landscape of very high order.

5	Mount. Taishan (World Heritage site, China)	(i) (ii) (iii) (iv)(v) (vi) (vii)	N 30°16′ E 117º5′	Area: 25,000ha, the highest altitude is 1,545m; the altitude difference is 1,400m. Mount. Taishan is a granite landform. Mount Taishan is temperate forest mountain landscape. The sacred Mount Tai was the object of an imperial cult for nearly 2,000 years, and the artistic masterpieces found there are in perfect harmony with the natural landscape. It has always been a source of inspiration for Chinese artists and scholars and symbolizes ancient Chinese civilizations and beliefs.	With nearly 3 billion years of natural evolution, Mount Taishan was formed through complicated geological and biological processes, which resulted in a gigantic rock mass covered with dense vegetation towering over the surrounding plateau. This dramatic and majestic mountain is an outstanding combination of a beautiful natural landscape dominated by the cultural impacts of thousands of years of human use.
6	Wulingyuan Scenic and Historic Interest Area (World Heritage site, China)	(vii)	N29°19′ E110°30′	Area: 30,080ha, the highest altitude is 1,264m; the altitude difference is 814.5m. Mount Wulingyuan is subtropical forest mountain landscape. A spectacular area stretching over more than 26,000 ha, the site is dominated by more than 3,000 narrow sandstone pillars and peaks, many over 200 m high. Between the peaks lie ravines and gorges with streams, pools and waterfalls, some 40 caves, and two large natural bridges. In addition to the striking beauty of the landscape.	The huge number of sandstone columns and peaks—more than 3,000—are spectacular. These, coupled with other land forms (natural bridges, ravines, waterfalls, streams, pools and caves) and dense broadleaf forest, present an aesthetically beautiful landscape enhanced by the mists and clouds which frequently shroud the site. There are more than 40 caves and two huge natural stone bridges, one of which rises 357 m above the valley floor.
7	Lushan National Park (World Heritage site, China)	(ii) (iii) (iv) (vi)	N29°25′ E115° 52′	Area: 30,200ha, the highest altitude is 1,474m. There are so many gullies, caves, streams and waterfalls, especially the famous three-step waterfalls. Mount Lushan is a red sandstone landform. Mount Wuyi is a subtropical forest mountain landscape. Mount Lushan is one of the spiritual centres of Chinese civilization. Buddhist and Taoist temples, along with landmarks of Confucianism, where the most eminent masters taught, blend effortlessly into a strikingly beautiful landscape which has inspired countless artists who developed the aesthetic approach to nature found in Chinese culture.	The natural beauty of Lushan is perfectly integrated with its historic buildings and features, creating a unique cultural landscape which embodies outstanding aesthetic value powerfully associated with Chinese spiritual and cultural life. Combining nature and culture, Mount Lushan represents the Chinese national spirit and epitomizes its cultural life.
8	Mount Wuyi (World Heritage site, China)	(iii) (vi)(vii) (x)	N27°43′ E117°40′	Area: 99,975ha, the highest altitude is 2,158m. Mount. Wuyi is a Danxia red sandstone landform. Wuyi is a subtropical forest mountain landscape. it The serene beauty of the dramatic gorges of the Nine Bend River, with its numerous temples and monasteries provided the setting for the development and spread of	The spectacular landforms in the eastern scenic area around Nine-Bend Stream (lower gorge) are of exceptional scenic quality, with isolated, sheer-sided monoliths of the local red sandstone. They dominate the skyline for a tortuous 10

				neo-Confucianism, which has been influential in the cultures of East Asia since the 11th century. In the 1st century B.C	km section of the river, standing 200-400 m above the riverbed, and terminate in clear, deep water. The ancient cliff tracks are an important dimension of the site, allowing the visitor to get a 'bird's-eye-view' of the river.

Based on the above comparison rules, we logically compare Fanjingshan with the Chinese World Heritage sites which feature mountain landscapes. Specifically, they are famous mountains, such as the Mount. Taishan, Mount. Huangshan, Mount Sanqingshan National Park, Mount Emei Scenic Area, Wulingyuan Scenic Area, Lushan National Park, Mount Wuyi. Fanjingshan has some difference with other famous mountains, although they all are subtropical mountain landscapes, and have some similarities on the landform, hydrology, plant, and the cloud and fog.

Comparative analysis conclusions

- Fanjingshan is at a larger scale than most of these famous mountains; the landscape is wider and spectacular with deep gorges, knife-edge-like Mountains, which is the typical steep scenery.
- These famous mountains all have different landforms based on their different lithology and structure. Fanjingshan has particular and layer columns, based on its metamorphic rocks, while the other mountains' column landscapes are based on granite or sandstone. For example, Mount Sanqingshan's pure granite underpins its diverse landforms, such as ridges and peaks, walls, gorges, especially its typical peaks characteristic of the geology's rare, long and deep vertical joints; Mount. Wuyi has a mainly Danxia type landform based on red sandstones, although it has metamorphic rocks at Pre-Sinian and Sinian system, and Mesozoic volcanic rocks, granite and clastic rocks; Wulingyuan Scenic and Historic Interest Area's tall column landscapes are based on quartz sandstone; Mount Huangshan's unique picturesque rocks are also based on naked granite, and the top of Mount Emei's is basalt, and the medium and low sections are granite, metamorphic rocks and limestone, the Golden Peak, Wanfoding, Qianfoding and Qingyinge, are the planation surfaces of the basalt with wide surfaces and steep surroundings. In contrast, the piedimont zone and the hills in dome of Fanjingshan have exposed epimetamorphic rocks, blastopsammite, and phyllite rocks at the areas of Phoenix Peak, Golden Peak, Doupengshan and Niutoushan; it is flat and the slope is usually 10-20°, which is the foundation of its landscape aesthetics. The recognizable landscapes, such as Mushroom Rock and Rolls of Book Rock, have flat attitude of

rock and vertical joints, which developed the column peaks and cliffs like thousands of books overlain, therefore, it is so steep and lofty.

- Although there are so many water landscapes among China's famous mountains, such as streams, rivers, lakes or waterfalls, those in Fanjingshan are the most massive. Mount. Huangshan has unique hot springs; three-step waterfalls in Mount Lushan are known to all for Li Bai's poems, and there are also Jiuqu Rivers in Mount Wuyi, and waterfalls in Mount Emei etc. But only in Fanjingshan, the '99' rivers are running radially from the top of the mountain, with over 20 big waterfalls with three steps, and countless cascades.
- All these famous mountains have abundant flora and fauna. Only Mount Emei, Mount Sanqingshan and Hubei Shennongjia can match with Fanjingshan in species diversity and variety and with altitudinal vegetation zones. The subtropical forest mountain landscapes of Fanjingshan distribute obviously, the flora and fauna are so abundant that the landscapes are diverse, where the five vertical zones from the subtropical evergreen broad-leaved forest to the alpine meadow show the 'four seasons in the mountain'.
- All the famous mountains such as the Mount Taishan, Mount. Huang, Mount Emei, Mount Lushan etc. are synergetically bringing out Chinese political culture, religious culture, educational culture etc., and have inspired many cultural landscapes. For example, as the first of Chinese Five Mountains, Mount Taishan is the closely related with Chinese imperial dynasty, there are so many buildings, roads, 823 inscriptions and steles, 6,293 stone ladders, classical temples, related to worship ceremony, so Mount Taishan is a highly humanized mountain landscape; Mount Huangshan has 100 more ancient buildings, such as pavilions and bridges, and 300 inscriptions; there have in the past been more than 100 temples in Mount Emei, and there are still 30 existing temples covering an area of 100,000 square meters, 164 cultural relics and historical sites, 6,890 collections in temples and museums. But Fanjignshan is far from Central China, where there was much more limited human activity and historical structures except Buddhist cultural relics. With the rapid tourism impact and the popular religion revival, several temples have been rebuilt, just centering on the entrance and the top of the mountain, Jinding, and the cable car, a small road and inscriptions by the hillside. Therefore, Fanjingshan has much more natural beauty than the other famous mountains.

Countless writers and poets have written numerous famous essays and poems about

the celebrated mountains from Han Dynasty, especially Tang Dynasty, such as Mount Taishan, Mount Huangshan and Mount Emei. These beautiful sceneries were the foundations of these works. For example, the popular poem “Goldenthal mountains and small world" and "would be extremely Ling, list of small hills"; and Huangshan, generated imaginations for creation, is in favor of many painters, who once had formed ‘Huangshanism’, and so on. These excellent poems and paintings have infuemned Chinese public scenery aesthetic patterns, i.e. ‘the most majestic of Mount Taishan, the most unique of Mount Huangshan, and the most delicate of Mount Emei’, even ‘Trips to China's five great mountains render trips to other mountains unnecessary, and a trip to Huangshan renders trips to the five great mountains unnecessary’ (Photo 3.13). However, Fanjingshan is far from the Han cultural center in Chinese history, and famous people hardly came here and wrote poems, so the landscape aesthetic of Fanjingshan has not been refined and widely transmitted with strongly influence to the public. Nevertheless, it has inspired spiritual beliefs, and became known as a place of famous Chinese Buddhist region. Fanjingshan has integrated “The Wonder of Mount Huangshan”, “The Elegance of Mount Emei”, “The Steepness of Mount Huashan” and “The Magnificence of Mount Taishan” together. “It is as precipitous as the Five Mountains (Wuyue), and its magnificence can be maintained for thousands of years.” Therefore, Fanjingshan is called “The family of the famous mountains in China”.

The towering of Fanjingshan is just like from the haven, around with chaotic peaks and vivid green as Penglai.Time and time again we asked the graceful gas and the different bells, memoried externally with mild wind to the paradise. -Xu Yan, a poet of the Qing Dynasty (1657-1723).

In conclusion, Fanjingshan’s subtropical mountain landscape, based on metamorphoric rock, has the same aesthetic importance as other landscapes based on granite, quartz sandstone and red sandstone. Fanjingshan is a living subtropical ecosystem due to its abundant flora and fauna and high altitude difference, especially the three circle-level waterfalls in the deep mountains which are unusual and spectacular. Fanjingshan exhibits its natural beauty more than other properties as it is less impacted by human activities and more inaccessible.

Photo3.13 Examples of some Chinese Mountain Heritage sites

3.2.c Comparative analysis based on the criterion (ix)

3.2.c.1 Biogeographical context of the nominated property

According to the classification of biogeographical province by Udvardy (1975), terrestrial realm-biome combination and terrestrial ecoregion by Olson et al. (2001), Fanjingshan belongs to the Palaearctic Realm's Oriental Deciduous Forest biogeographical province (Figure 3.1), Tropical and Subtropical Moist Broad-leaved Forest and Guizhou Plateau broad-leaved and mixed forest (Figure 3.2). In view of the aesthetic importance, biological process and biodiversity, there are 9 representative World Heritage sites and 6 Tentative List sites in the same biogeographical province, 3 World Heritage sites and 1 Tentative List sites in the same terrestrial realm-biome combination and 2 representative World Heritage sites in the same terrestrial ecoregion to where Fanjingshan belongs to (Table 3.3). Among these sites, there are 9 sites meeting criterion (vii) or claiming to meet (vii) in the case of Tentative Listed sites. They are Wulingyuan Scenic and Historic Interest Area, Mount Sanqingshan National Park, Mount Taishan, Mount Huangshan,

South China Karst, China Danxia, Tianzhushan, ShuDao, Mt. Soraksan Nature Reserve and Mt. Kumgang and the Historical Relics in and around the Mountain. Shirakami-Sanchi and Shennongjia Nature Reserve meet criterion (ix). 6 sites meeting or claiming to meet criterion (x) are as follows: Mount Huangshan, Mount Emei Scenic Area including Leshan Giant Buddha Scenic Area, Shennongjia Nature Reserve, ShuDao, Mt. Soraksan Nature Reserve and Mt. Kumgang and the Historical Relics in and around the Mountain. Shennongjia Nature Reserve meets both criteria (ix) and (x). And Mount Huangshan, ShuDao, Mt. Soraksan Nature Reserve and Mt. Kumgang and the Historical Relics in and around the Mountain are the 4 sites meeting or claiming to meet criteria (vii) and (x).

Shirakami-Sanchi, meets criterion (ix), preserving the last unexplored relict of frigid *F.sieboldii* forest and Shennongjia Nature Reserve is the most representative site of evergreen deciduous broadleaf and mixed forest ecosystem in the northern hemisphere. While Fanjingshan has developed the *Fagus* forest which is widespread and the strongest primordial and has significantly showed the evolution value of *Rhinopithecus brelichi*, *Abies fanjingshanensis* and *Fagus*.

Table 3.4 Biogeographical context of the nominated property

Type	Fanjingshan	World Heritage Sites in the Same Biogeographical Unit	Tentative List Sites Potentially in the Same Biogeographical Unit	Reference/ Description
Biogeographical province	Palearctic Realm, Oriental Deciduous Forest Province	Wulingyuan Scenic and Historic Interest Area (China) Mount Sanqingshan National Park (China) Mount Taishan(China) Mount Huangshan#(China) Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area#(China) South China Karst*(China) China Danxia*(China) Shirakami-Sanchi#(Japan) Hubei Shennongjia#(China)	Yandang Mountain (China) Yangtze Gorges Scenic Spot (China) Tianzhushan (China) ShuDao#(China) Mt. Soraksan Nature Reserve#(Republic of Korea) Mt. Kumgang and the Historical Relics in and around the Mountain #(Democratic People's Republic of Korea)	Udvardy, 1975
Terrestrial realm-biome combination	Tropical and Subtropical Moist Broadleaf Forests	Wulingyuan Scenic and Historic Interest Area(China) South China Karst*(China) China Danxia*(China)	Yandang Mountain(China)	Olson et al., 2001
Terrestrial ecoregion	Guizhou Plateau broadleaf and mixed forests	Wulingyuan Scenic and Historic Interest Area(China) South China Karst*(China)	–	Olson et al., 2001

The criteria for these sites include the criterion (ix) or (x).
* Jinfoshan Karst is chosen as the representative site of South China Karst and Longhushan section as the representative site of China Danxia.

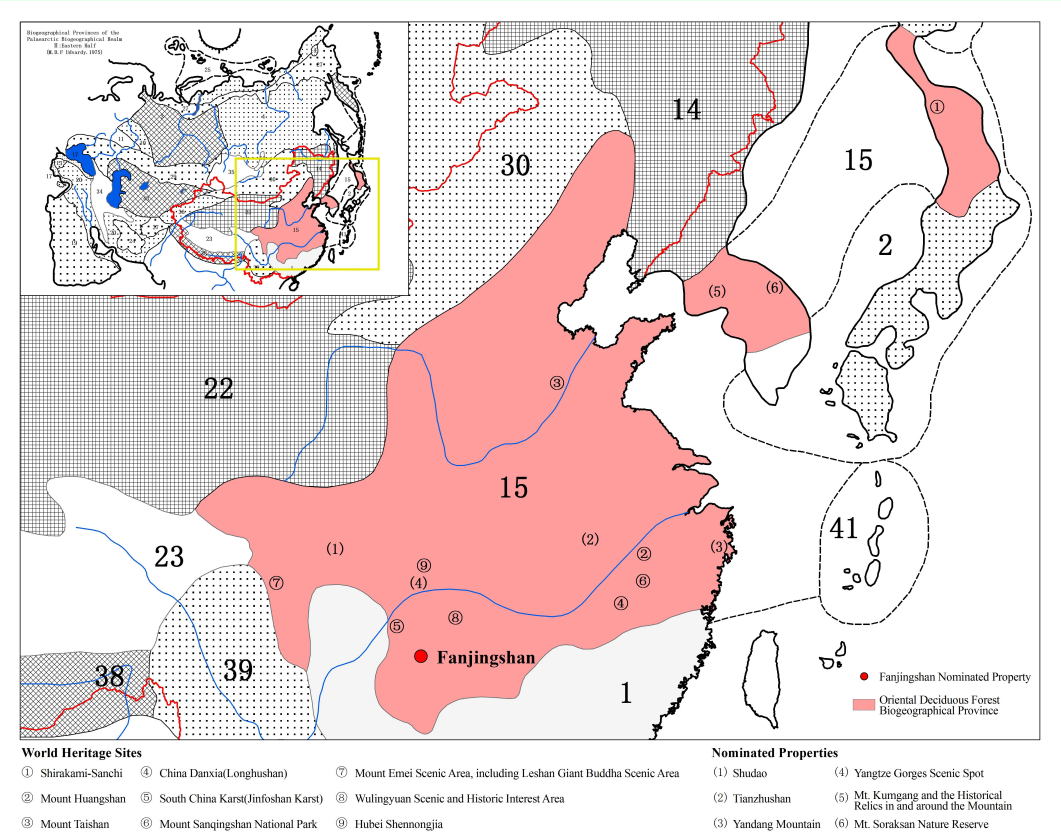


Figure 3.1 Locations of Fanjingshan and other Natural Heritage sites similar with Fanjingshan in the same biogeographical province

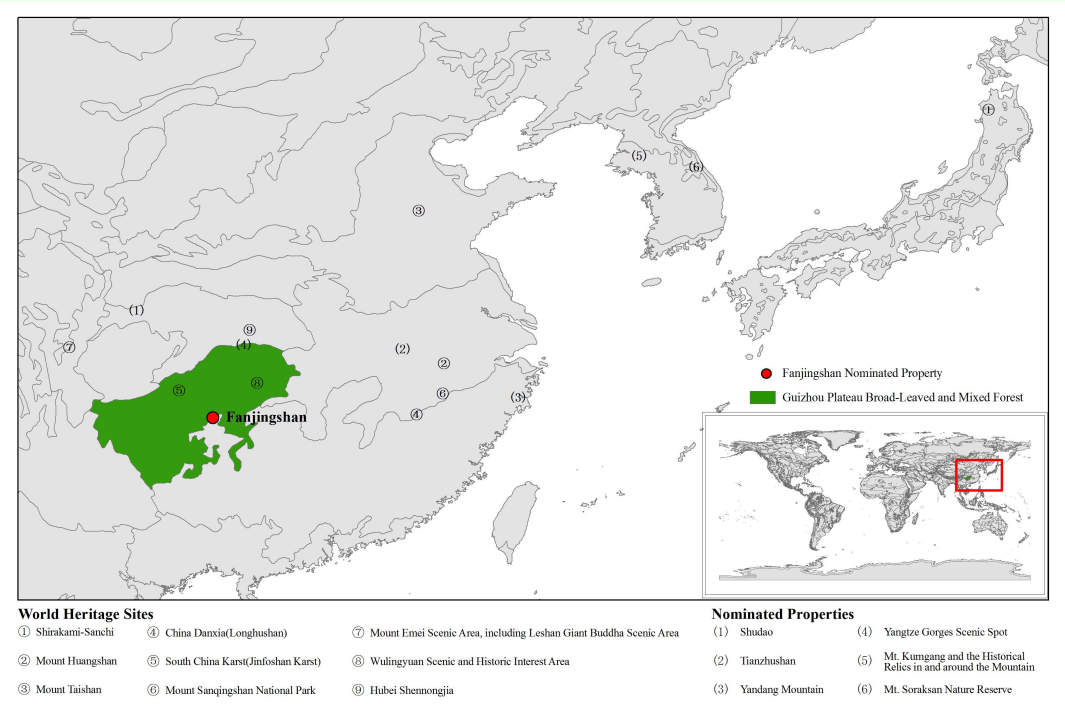


Figure 3.2 Locations of Fanjingshan and other Natural Heritage sites similar with Fanjingshan in the same terrestrial ecoregion

3.2.c.2 The nominated property in the context of broad-scale global conservation priorities

The nominated property has been assessed on the basis of several global biodiversity prior systems including terrestrial biodiversity hotspots by Mittermeier et al. (2004) and William et al. (2011), high biodiversity wilderness areas by Mittermeier et al. (2002), Global 200 priority ecoregions by Olson et al. (2002), Endemic Bird Areas by Stattersifeld et al. (1998) and Centres of Plant Diversity by Davis et al. (1994, 1995, 1997). Fanjingshan is located in the Southeast China-Hainan Moist Forest of Terrestrial Global 200 priority ecoregion (Figure 3.3), the Yangtze River & Lake of Freshwater Global 200 priority ecoregion (Figure 3.4) and Chinese subtropical forest and South-east Chinese mountains of Endemic Bird Areas. Within the same biogeographical province, there are 3 representative World Heritage sites and 3 Tentative List sites located in this Terrestrial Global 200 priority ecoregion, 6 representative World Heritage sites and 3 Tentative List sites in this Freshwater Global 200 priority ecoregion, and 4 World Heritage sites and 3 Tentative List sites in these two Endemic Bird Areas (Table 3.5). Among these sites, there are 7 sites meeting the criterion (vii) which are as follows: Wulingyuan Scenic and Historic Interest Area, Mount Sanqingshan National Park, Mount Huangshan, South China Karst, China Danxia, Tianzhushan and ShuDao. Shennongjia Nature Reserve and Shirakami-Sanchi meet criterion (ix). The 3 sites meeting criterion (x) are as follows: Mount Huangshan, Mount Emei Scenic Area including Leshan Giant Buddha Scenic Area and ShuDao. Shennongjia Nature Reserve is the only site meeting both criteria (ix) and (x). And Mount Huangshan and ShuDao are the 2 sites meeting the criteria (vii) and (x).

Table 3.5 The nominated properties in the context of broad-scale global conservation priorities within same biogeographical province

Type	Fanjing shan	World Heritage Sites in the Same Priority Region	Tentative List Sites Potentially in the Same Priority Region	Reference /Description
Terrestrial biodiversity hotspot	–	Shirakami-Sanchi#(Japan) (Belongs to Japan Hotspot)	–	Mittermeier et al., 2004; William et al., 2011
High biodiversity wilderness	–	–	–	Mittermeier et al., 2002
Terrestrial Global 200 priority ecoregion	√	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area#(China) China Danxia*(China) Hubei Shennongjia#(China)	Yandang Mountain(China) Yangtze Gorges Scenic Spot(China) ShuDao#(China)	Olson et al., 2002
Freshwater Global 200	√	Wulingyuan Scenic and Historic Interest Area(China)	Yangtze Gorges Scenic Spot(China)	Olson et al., 2002

priority ecoregion		Mount Sanqingshan National Park(China) Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area#(China) South China Karst*(China) China Danxia*(China) Hubei Shennongjia#(China)	Tianzhushan(China) ShuDao#(China)	
Endemic Bird Areas	√	Mount Sanqingshan National Park(China) Mount Huangshan#(China) Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area#(China) China Danxia*(China)	Yangtze Gorges Scenic Spot(China) Tianzhushan(China) ShuDao# (China)	Stattersfield et al., 1998
Centre of Plant Diversity	—	—	—	Davis et al., 1994; 1995 and 1997

The criteria for these sites include the criterion (ix) or (x).
* Jinfoshan Karst is chosen as the representative site of South China Karst and Longhushan section as the representative site of China Danxia.

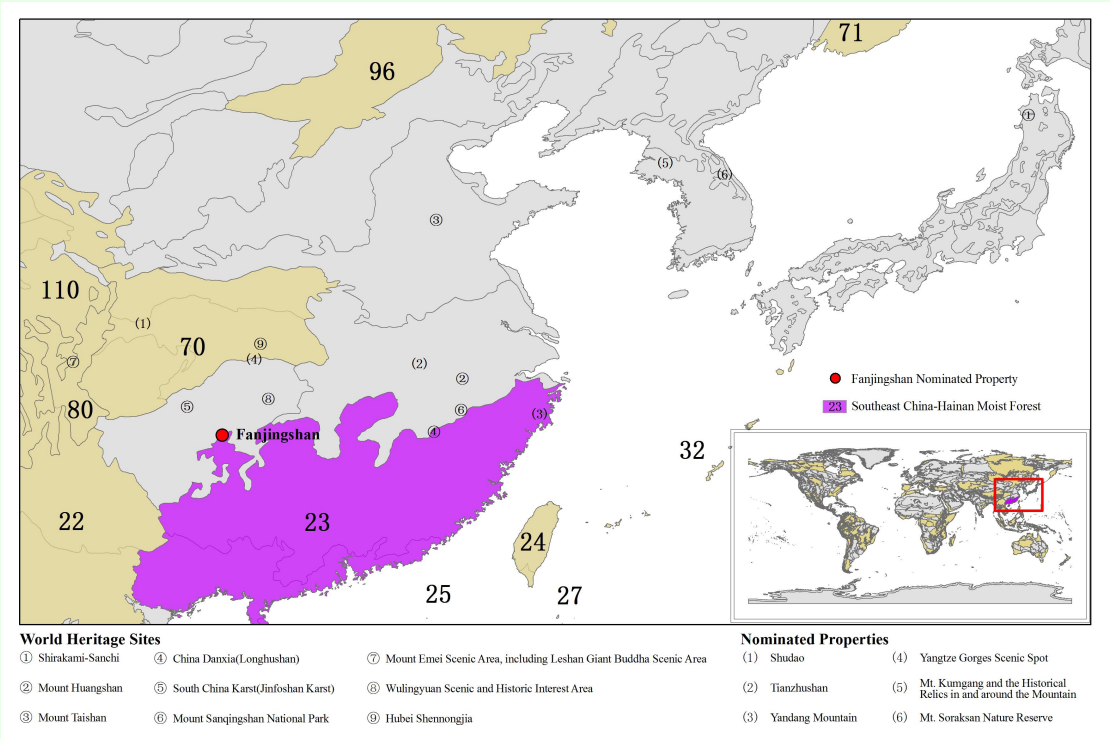


Figure 3.3 Location of Fanjingshan and other Natural Heritage sites similar with Fanjingshan in Terrestrial Global 200 priority ecoregion

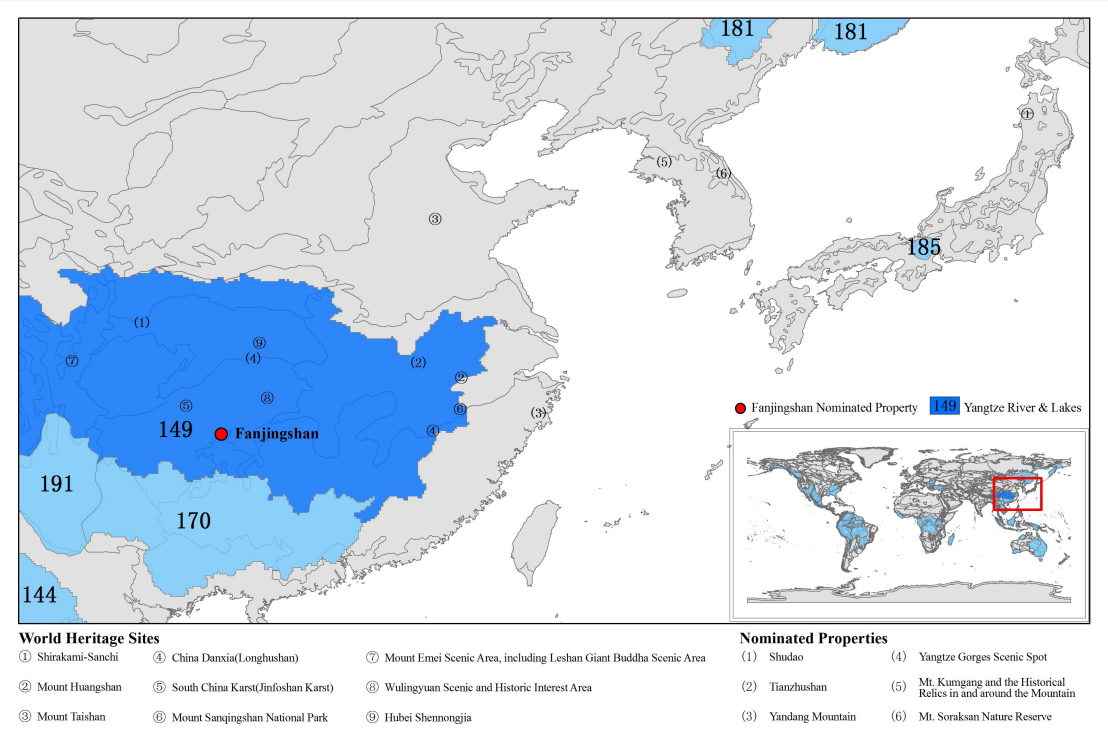


Figure 3.4 Location of Fanjingshan and other Natural Heritage sites similar with Fanjingshan in Freshwater Global 200 priority ecoregion

3.2.c.3 Comparative analysis of ecological system in ecological islands of the world

Among the World Heritage sites and Tentative List sites in the world, we select 20 areas with the characteristics of ecologically isolated island to compare and analyze. Iguazu National Park, Lord Howe Island Group, Heard and McDonald Islands, Cocos Island National Park, Alejandro de Humb oldt National Park, Aldabra Atoll, Garajonay National Park, Gorge of Samaria National Park, Island of Saba and Cat Ba Archipelago are the regions which exhibit genuine ecologically isolated island phenomena. Their ecological developments base on volcanic rocks or coral reefs, which reflect the biological and ecological processes of these islands. The properties of their ecological systems are tropical or polar, providing habitats to sea creatures and birds. These islands are entirely different to Fanjingshan in the ecological processes of ecologically isolated island and biodiversity.

The Okavango Delta is a large isolated tropical swamp wetland, surrounded by Kalahari Desert, it recognized as one of the largest inland delta in the world. Climate change on islands is diverse, meanwhile, threatened by floods, drought and wildfires, so that the island's biological evolution and adapt to these natural disasters, animals and plants become unique. Waterton Glacier International Peace Park is ecological based on

mountain and glacial features. In the mountain glaciers and ice sheets of the ocean, with grasslands, forests, mountains and glaciers and other landforms, the rapid rise of the terrain made it become “mountains meet the prairie in here”, the distribution of wild fauna and flora in the region also corresponds to differences in geographical features, which is completely different from evolution of Fanjingshan ecosystem. Mulanje Mountain Biosphere Reserve located in Africa, Savannah climate,has its ecological evolution background of syenite, quartz-syenite and granite rock materials. Sudden rise to plateau mountain from the plain, unique structure and highly formed where the capricious climate, it is favor to the development of rare and unique biological ecology, highly rich biodiversity and form a unique plateau ecological process, growing of plants and animals are completely different from Fanjingshan. Above all, because the nature of ecological island difference is so distinct from Fanjingshan, no further analysis is undertaken. Others areas with comparative value are as follows (Table 3.6):

Table 3.6 Comparative analysis of ecological system in ecological island of the world

No.	World Heritage /Tentative List Heritage Sites	Crite-ria	Geographical Location	Ecosystem Types	Ecological Characteristics	Biological Diversity
1	Fanjingshan (Tentative List Heritage Site, China)	(vii) (ix) (x)	N27°53′ E108°41′	Mountain	The ecological island surrounded by Karst, located in “Palae-arctic Realm-Oriental Deciduous Forest Province”. The topographic prominence metamorphic rocks geomorphological matrix which is surrounded by karst landform, deciduous broad-leaved forest, climate and soil vertical zonation, records the biological process of ecological environment changes along with the nomination. The ancient plant pollen and vegetation change records the ongoing ecological processes; The biota is not closely related to Karst, ecosystem integrity, perfect *Fagus* forest sustains the *Rhinopithecus brelichi* 's survival and reproduction; Forest system of ancient and native strong, The site is an outstanding ecological example of the interplay between geographical position, geological landforms and climate specificity	Fanjingshan is the unique habitat of *Rhinopithecus brelichi* and *Abies fanjingshanensis,* has continuous *Fagus* forest with the largest area in the subtropics. The site contains great species diversity and retains considerable ancient relict plants.

2	Mount Emei Scenic Area (World Heritage site, China)	(iv) (vi) (x)	N29°32' E103°46'	Mountain	Anticline, fold and fault block mountain, located in the edge of the Sichuan Basin, the transition zone of the East Himalayan plateau . Remaining the integrity of sedimentary strata and the particularity of Mt. Emei basalt of the Late Permian, as the marine strata in Mt. Emei area is well-developed and preserved and is rich in fossils. There are many different kinds of vegetation zone within 2,600 m, with joe, irrigation, grass, and the outer layer, the layers of rich and complete structure. Biological, soil, climate, vertical zone with a clear and complete, most typical and best protected subtropical vegetation types, and most primary and complete subtropical forest vertical distribution belts in the world; Flora is located in the transitional section between the Sino-Himalayan and Sino-Japanese floristic sub-regions, animals distribute in the transitional zone between Palearctic realm and Oriental realm. With a myriad of animal and plant resources, distinguished regional features.	There are 3299 species high plants, 1600 are medicinal plants, endemic plants 107 species, such as *Parakmeria omeiensis,Sibbaldia omeiensis,Rhododendron hemsleyanum*, etc. Over 2,300 species of animals, including 51 of mammals, 34 of reptiles, 33 of amphibians, 256 of birds and so on, *Rana chevronta, Brachypteryx leucophrys nipalensis and Dicaeum concolor olivaceum* are ecdemics to Mt. Emei. 268 species of butterflies, such as the rare *Kallima inachus* Boisduval and *Papilio arcturas* Westwood
3	Galapagos Islands (World Heritage site, Ecuador)	(vii) (viii) (ix) (x)	N0°49 ' W91°0'	Island	Located 1,000 kilometers from the South American continent on the Pacific Ocean, with 19 islands and the surrounding sea. The island crosses the equator, from the south of Peru and the cold north of the equatorial warm intersection here, present a strange sight for both cold and tropical animals; The creature is conducted in isolated cases, the islands demonstrate ecological processes, biological evolution and geographical processes between different islands and flora and fauna on individual islands.	The islands have moderate species diversity and many endemic plants, 80% of land birds, 97% of reptiles and land mammals, 30% of endemic plant, such a native flora including about 500 vascular plant species of which about 180 are endemic, with 2,909 marine species identified with 18.2% endemism.
4	Manu National Park (World Heritage site, Peru)	(ix) (x)	S12°15' W71°45'	Mountain	At the transition zone of the tropical Andes and the Amazon lowland forests, from cliffs delays and the massive altitudinal gradient; Between the Andes of cold, dry climate and between heat and humidity of the amazon forest; Low-level tropical jungle, mountain	Estimates of plant diversity range between 2,000 and 5,000. Records of fauna are similarly impressive with well over 1,000 vertebrate species,

					forest and grassland ecological environment in this development, and each kind of ecological environment are growing their respective fauna and flora.	including many endangered and charismatic species. Thousands of higher plant species are distributed across the diverse ecosystems, habitats and niches. Hundreds of tree species have been identified, often jointly growing within very small areas.
5	Putorana Plateau (World Heritage site,Russian Federation)	(vii) (ix)	N69º2' E94º9'	Mountain	It is situated about 100 km north of the Arctic Circle and consists of Siberian trap, the highest elevation of 1,700 m, is the highest part of the Siberia Plateau; With a complete set of subarctic and arctic ecosystems in an isolated mountain range, including pristine taiga, forest tundra, tundra and arctic desert systems, as well as untouched cold water lake and river systems. A major reindeer migration crosses part of the property; The property may provide a demonstration of ecological processes, including the interaction of healthy populations of the whole arctic fauna.	There are Brown Bear, Goshawk, Cinereous vulture, Arctic wolf, Reindeer, Arctic fox, Arctic owl and so on.
6	Mt. Kinabalu (Malayasia)	(ix) (x)	N6 º 15', E116º 30'	Mountain	Located in the verge of tropical seas, at the north of Borneo, is the highest mountain between the Himalayas and New Guinea, altitude of 4,095 m and the Pliocene granodiorite dome; From low altitude lowland forests to high-altitude alpine grassland development, with the increasing of height, present different climate growth of plants and animals and the unique geological features; The Pleistocene glacier remains developed from the bottom up, the vertical landscape changes.	The property consists of a huge mountain emerging as an ecological 'island' from a 'sea' of lowland forests. As the highest and largest mountain emergent in Borneo, the site preserves the largest range of Borneo's mountain species including some narrow range endemic vertebrates and a few site specific endemic plants and invertebrates.

7	Virgin Komi Forests (Tentative list Heritage site, Russian Federation)	(vii) (viii) (ix) (x)	N63 º 37' E58 º 57'	Mountain	Komi virgin forest is located in the Russian Urals foothills, along the foothills of the decomposition of limestone formed a karst terrain; Elevation between 98 m-1,895 m, a glacier is mainly composed of land, mountain glacier is typical geographical characteristics of this area, vertical zonal differentiation is obvious, and different geographical features of the geographical unit growth is significantly different vegetation types; Underground caves, craters, seasonal rivers has been protected as a natural heritage.	More than 600 species of the vascular plants, tens of species of mosses and lichens. 42 species of mammals, about 200 species of birds, 21 species of fish, 3 species of amphibians, 1 species of reptiles. Mammals include Beaver, Wolves, Foxes, Brown bear, Moose and so on.

The sites compared above come from very different ecological contexts and include systems in the marine realm. They have nevertheless been analyzed as they exhibit the same bio-geographical island phenomenon as Fanjingshan in the evolution and development of biodiversity and ecology.

Comparative analysis conclusions

- Galapagos Islands are marine ecological islands with very high levels of endemism. The island crosses the equator, from the south of Peru and the cold north of the equatorial warm intersection here, form a small ecological environment, present a complete and unique bio-ecological processes for both cold and tropical animals, known as the "unique living museum of biological evolution"; Hordes of fringillidae of mouth have obvious difference, which laid the foundation for Darwin's theory of evolution. Although Fanjingshan and the island belong to totally different ecosystem types. Fanjingshan completely surrounded by a karst sea and this well protected, their bio-ecological evolution process is typical and unique.
- Mount Emei Scenic Area, Manu National Park, Mt. Kinabalu, Putorana Plateau, Virgin Komi Forests and Fanjingshan are all inland ecologically isolated islands. Mount Emei Scenic Area, including the Leshan Giant Buddha Scenic Area with sedimentary strata and the particularity of Mt.Emei's base rock foundations for its ecological evolution, its tectonic denudation and glacier landforms, Biological, soil, climate, vertical zone with a clear and complete, provides the most typical and best protected subtropical vegetation types in the world, with a myriad of animal and plant resources, distinguished regional features, primitive and endemic species are rich, and animals like *Ailurus fulgens*,*Uropsilus andersoni*, *Platylacopus intermedius* and *Rana chevronta.* Manu National Park, whose ecological base is volcanic rock, elevation vertical drop large, and climate change, habitat development intact, includes greatly diversified habitats, original forests and various animals like the

giant otter, the giant armadillo and jaguars. Mt. Kinabalu located in the verge of tropical seas, is the highest peak in Southeast Asia, elevation gap and large mountain, making it a lowland forest protruding alpine ecological island, vertical landscape changes significantly, preserves the largest range of Borneo's mountain species. Putorana Plateau, with its ecology based on desert and tundra, has an isolated mountain range of subarctic and arctic ecosystems and is a part of the major migration routes of reindeers, a monitor of the climate change in the Arctic and a habitat of brown bear, goshawk, Cinereous Vulture, Arctic Wolf, reindeer, Arctic Fox and so on. Virgin Komi Forests, whose landform is based on mountain glaciers, swamps, river beds and foothills karst, has developed the most extensive areas of virgin boreal forest remaining in Europe and contains various types of habitats that are available to many tall trees such as Germany pines, Siberian pine wood etc. The property also includes animals like red-breasted goose, fish-hawk, golden eagle, white-tailed eagle, gerfalcon, peregrin (duck hawk), black stork, common crane etc. Although the properties of the mountain ecosystem they belong to are similar to Fanjingshan, due to the difference of the geographical position, ecological matrix and climate impact, they show great differences with Fanjingshan in the ecological processes and the main organisms of ecological systems.

3.2.d Comparative analysis based on biological diversity criterion (x)

Table 3.7 Comparison of overall biological richness of nominated property site with the some other subtropical/ temperate mountain forest sites and regions in China, Asia, North America and entire European countries.

Name	Area (km^2)	Mammal	Bird	Reptile	Amphibia	Fish	Butterfly	Vascular Plants
Fanjingshan	403	80	224	43	43	60	c. 150	2,933
Mount Wuyi (S+N)	1,460	75	269	73	35	40	240	2,181
Chishui	722	72	147	37	31	117	c.1500	2,116
Yushan (Taiwan)	1,055	50	151	18	13	12	228	2,522
Shennongjia	733	87	389	51	36	46	c. 150	3,479
Changbai Mts	1,965	66	285	17	13	40	105	2,300
Huangshan	160	48	170	38	20	24	No data	1,300
Phong Nha Kebang (VN)	874	113	302	50	31	72	No data	c.1,200
Yellowstone (US)	8,992	61	318	6	6	20	120	1,700
Yosemite (US)	3,082	90	241	21	13	12	112	1,400
UK (whole)	241,590	50	229	15	12	30	67	1,623
Norway	324,220	54	241	5	7	69	101	1,715
Netherlands	41,534	55	192	17	13	67	111	1,221
Denmark	43,094	43	196	17	9	70	93	1,450

3.2.d.1 Comparison with other snub-nosed monkey sites

There are five species of Snub nosed monkeys in the world including *Rhinopithecus roxellana*, *Rhinopithecus bieti*, *Rhinopithecus brelichi*, *Rhinopithecus avunculus* and *Rhinopithecus strykeri,* all are found in southwest China, and marginally Vietnam and Myanmar. The genus is a very old branch of the Colobine Old World Monkeys and of great interest to primate evolution. All species are quite distinctive in appearance and habits (Table 3.8). All form important elements of the biodiversity values of OUV under criterion (x) in respective World Heritage sites and Tentative Listed sites but in no other case is an entire snub-nosed monkey species confined to a single site giving Fanjingshan a unique claim of irreplacability. Indeed, it is extremely unusual to find an entire large mammal species distribution is contained within a single site.

Table 3.8 Comparison of 5 species of Snub-nosed monkeys

	Rhinopithecus roxellana	***Rhinopithecus bieti***	***Rhinopithecus brelichi***	***Rhinopithecus avunculus***	***Rhinopithecus strykeri***
Photos					
Discovery time	1870	1871	1903	1910	2010
Discoverer	David	Sonlie	Bleri	Dollman	Geissmann
Namer	Milne Edwards	Milne Edwards	Thomas	Dollman	Geissmann
Type locality	Baoxing , Sichuan	Deqin , Yunnan	Tongren , Guizhou	Tonkin , Vietnam	Kachin State , Myanmar
Discriminant features	The color of hair is gorgeous, Large body, enlarged and prominent lip, blue face, nostril upward. The body of adult monkey is back and shoulder has golden hair, especially the male monkeys are the most significant	The large body, long head was significantly longer than the tail length, head with a black hair pointed crown, nostril upward. Back of body and lateral limbs profile are black, the medial ventral limbs profile is gray white. Hips, femoral with long hair plaque	*Rhinopithecus brelichi* is similar to *Rhinopithecus roxellana* in size, but the tail longer than that. Back is not particularly long with dark brown, back of adult between the shoudler has a pale yellow white patches	*Rhinopithecus avunculus* smaller than *Rhinopithecus bieti*, Back is black, but the head of the snub-nosed monkey has no hairs crown. The belly of body is milky yellow belly, tail longer than the Black snub-nosed monkey with light in color	The species are chiefly diagnosed by its almost entirely blackish fur coloration with white fur only on ear tufts, chin beard, and perineal area, and its tail is relatively long, which is 140% of head and body length in the adult male

Distribution	A total of 25,000km^2 in Min shan, Qionglai shan, Daxue shan and Xiaoliang shan (Hu, 1998). A total of 13,184.5 km^2 in Qinling Mountains ,Shen nongjia and Motianling	Distributed in both sides of the mountains and canyons of Yunling mountain in the Hengduan Mountains,Ning jing mountains in Tibet about 20,000 km^2	Distributed in Fanjingshan, about 260 km^2	Distributed in Tuyen Quang and Beitai states, about 285 km^2	Distributed in the northeast a small area of the kachin state, Gaoligong mountains between Maw River and Nujiang river about 270 km^2
Population	About 20,000-25,000	About 1,700	Sampling survey for about 750	About 290-350	A total of 750-950 in China and Myanmar
Habitats	Distribution mainly confined to north subtropical areas. medium altitude mountain, middle and low mountains and the relative elevation of large areas.Mainly in the 1,400-3,300 m forest in the deciduous broad-leaved forest of the altitude, the coniferous and broad-leaved mixed forest and the Sub Alpine coniferous forest in the sub alpine forest	Mainly live in the mountains and canyons, in altitude 3,000-4,700 m subalpine dark coniferous coniferous, mixed coniferous and broad-leaved forest and mountain shrub, meadow and flow stone beach, it is the only primates live in such a cold area type	Mainly live in altitude 1,300-2,000m evergreen broad-leaved forest and deciduous broad-leaved mixed forest	Mainly live in altitude 300-1,150 m karst mountain plant species and bamboo forests, with poor wildlife biological diversity and abundance	Mainly concentrated in the 2,400-3,300 m range moist evergreen broadleaf forest and some bamboo forest
Feeding habits	Feed on *Pinus armandii*, *Populus lasiocarpa*, *Pinus massoniana*, *Pinus tabuliformis*,*Raphanus raphanistrum* etc. more than 100 kinds of plants	Feed on the tender leaf and buds of *Picea asperata*, and some *Usnea*	More than 100 kinds of broadleaf plants of leaves, petioles, buds, flower buds, bark, fruits and seeds, and insects	Feeding plants to reach 17 families 52 kinds	Mainly feed on leaves, fruits and seeds of habitat
Reference/ description	Quan, 2002; Shi, 1992; Su Y. J. 1998	Shi, 1984; Ren, 2004; Li, 1981; Bai,1988	Quan,2002; Cui,2014; Yang,2002; Bleisch,1993; Xie,1987; Bleisch,1998; Nie,2009; Xiang Zuofu,2012	Pham,1994; Quan,2002; Wilfred,1932; Ratajszczak,1992	Chen,2015; Hong, 2015; Geissmann,2011

Comparative analysis conclusions

In the history of the evolution of *Rhinopithecus*, *Rhinopithecus brelichi* is the only representative in sub-tropical forests on the south side of the Yangtze River. It is the rarest of the four kinds of snub-nosed monkeys distributed in China, quite distinct from other species in appearance and ecology, feeding on a much wider range of foods in a temperate forest environment rather than in the alpine zone.

3.2.d.2 Comparison of *Abies Fanjingshanensis* with other rare and endangered *Abies*

There are 52 species, 1 subspecies and 12 varieties of *Abies* in the world, mainly distributed in the North American Rocky Mountains, Mediterranean coast - Alps, and Chinese Hengduan mountains (Xiang, 2006). The genus *Abies* contains a large number of endemic and relic species of which 16 are confined to China. *Abies fanjingshanensis* is one of only 5 rare and endangered *Abies* species endemic to China that are distributed in the subtropical zone. The 5 species of rare and endangered *Abies* endemic to China (*Abies fanjingshanensis, Abies beshanzuensis, Abies yuanbaoshanensis, Abies beshanzuensis* var. *ziyuanensis, Abies chensiensis*) are compared from the distribution, climate, habitat, community and population characteristics (Li, 2013) (Table 3.9).

Table 3.9 The subtropical endemic and relict specie of *Abies*

Species		***Abies fanjingshanensis***	***Abies beshanzuensis***	***Abies yuanbaoshanensis***	***Abies beshanzuensis* var. *ziyuanensis***	***Abies chensiensis***
Photos						
Discovery time		1981	1976	1979	1979	1891
Discoverer		Huang Weilian	Wu Mingxiang	Fu Liguo	Fu Liguo	Tiegh
Geographical position	Distribution	Fanjingshan in Guizhou Province	Baishanzu Mountain in Zhejiang Province	Yuanbaoshan Mountain in Guangxi Autonomous Region	Yinzhulaoshan Mountain in Guangxi Autonomous Region, Mingzhulaoshan Mountain, Dayuan Forest, Shunhuangshan Mountain,	Qingba Mountain

					Qianjiadong Cave, Daguping Forest in Hunan Province, Pingshuishan Mountain in Jiangxi Province	
	Latitude and longitude	N 27.9° E 108.8°	N 27.06° E 119.02°	N 25.4° E 109.1°	N 26.0°-26.6° E110.5°-114.0°	N 30.8°-34.3° E103.3°-112.6°
	Altitude(m)	2,050-2,390 m	1,700m	1,700-2,050 m	1,360-1,900 m	1,350-2,500 m
Distribution feature	Continuous / fragment distribution	Continuous distribution	Point distribution	Continuous distribution	fragment distribution	fragment distribution
Climate feature	Annual mean temperature	7.4℃	10.2℃	10.2℃	10.1℃	7.6℃
	More than 10 DEGC accumulated temperature	2,580℃	3,210℃	3,215℃	3,220℃	2,760℃
	Precipitation	1,265.4mm	1,652.4mm	1,941.0mm	1,538.8mm	764.4mm
	Annual relative humidity	77%	79%	79%	81%	69%
Habitat feature	Slope position	Upper slope	Middle slope	Upper slope	Middle and upper slope, ridge	Upper slope, ridge, mountain valley
	Slope direction	Shady and semi-shady slope	Semi-shady slope	Shady and semi-shady slope	Shady and semi-shady slope	Shady and semi-shady slope
	Slope degree	30-60°	10-20°	10-70°	10-75°	10-70°
	Litter thickness	2-6cm	5cm	5-15cm	5-10cm	5-10cm
	Human disturbance intensity	low	low	low	High	Local high
Community feature	species composition	36 families 51 genera 74 species	-	48 families 76 genera 103 species	26 families 38 genera 54 species	45 families 77 genera 98 species
	Space structure: tree layer	The canopy Density is about 0.3-0.65, *Abies fanjingshanensis*, *Tsuga chinensis* et al. are dominated	The canopy Density is about 0.9, *Fagus lucida* , *Cyclobalanopsis multinervis* are dominated	The canopy Density is about 0.9, *Abies yuanbaoshanensis, Litsea pedunculata, Illicium simonsii* etc are dominated	The canopy Density is about 0.7, *Phyllostachys edulis, Abies beshanzuensis* var. *ziyuanensi*, *Pinus massoniana* etc are dominated	The canopy Density is about 0.9, *Abies chensiensis, Carpinus turczaninowii, Quercus aliena* var. *acutiserrata* are dominated
	Space structure: Shrub	Cover	Cover	Cover degree	Cover degree is	Cover degree

		layer	degree is about 50%, high is 0.5-3m, few species, *Arundinaria faberi* thickly grows	degree is about 60%, high is 2m, *Yushania baishanzuensis* is dominated	is about 40-90%, more species, *Fargesia nitida* thickly grows	about 50%, Few species, *Yushania basihirsuta* is dominated	is about 60-80%, more species, *Fargesia qinlingensis* is dominated
		Herb layer	Cover degree is 5-10%, few species	Cover degree is about 15%, few species	Cover degree is about 20-60%, few species	Cover degree is about 10%, few species	Cover degree is 40-50%, more species
		Inter layer plants	Bryophyta are rich	Richness is low	Pteridophyta	Richness is low	Carex *sp.* are dominated
Population feature	Population quantity		About 10,000, plants with fruit	Only 3, no seedling, cone	More than 900	Less than 600	More population, plants with fruit
	Population age structure		The seedings, saplings and trees whose diameter at breast height are less than 20cm are more	Diameter at breast height respectively are 43.4cm, 34.7cm, 23.8cm	The age structure of population showed irregular pattern	Seedlings are more	The seedings and old trees whose diameter at breast height are less than 20cm are more
	Population structure type		Growth type, trend to stable type	Decline type	Growth type, trend to stable type	Growth type	Growth type
Reference /description			Xiang, 2001; Li, 2013	Li, 2013; Ai, 2005	Li, 2013; Li et al., 2002	Ning et al., 2005; Li, 2013	Zhang et al., 2004; Li, 2013

According to the sporopollen and fossils of *Picea* and *Abies* found in Late Pleistocene strata in Panxian county, western Guizhou in 1977 and found in mountains of southeastern China, it is illustrated that the temperature in the Late Pleistocene Epoch was much cooler than nowaday and *Picea* and *Abies* forests, adapting with the moist and cool biotope, spread to lower latitudes and altitudes (Kong, 1977). Afterwards, along with the warming climate, the *Abies* forests in lower latitudes gradually degenerated, located in the shady slopes of subalpine areas and finally formed a pattern of discontinuous distribution like islands in subtropics. For those forests located in northeastern Guizhou Province where they would have been by cold currents in winter, Fanjingshan, with its high relative altitude, became a special refuge for *Abies* forests

during geologic era and finally preserved *Abies Fanjingshanensis* forest which belongs to subalpine coniferous forest.

Among 5 rare and endangered species of *Abies* distributed in the subtropics, *Abies chensiensis* has a large population spread over a wide area, but part of this population is found in the north of Qinling Mountains. *Abies beshanzuensis*, *Abies yuanbaoshanensis* and *Abies ziyuanensis* are all distributed at lower altitude, but have small populations and areas which are scattered. *Abies fanjingshanensis*, with a relatively large area and concentrated distribution, occurs in the upper areas of Fanjingshan in the middle subtropics and possesses a transitional characteristic of Pacific monsoon and Indian monsoon, so it is special and precious.

Comparative analysis conclusions

The following characteristics distinguish *Abies fanjingshanensis* from other *Abies* spp detailed above and thus emphasizes the globally significant value of the nominated property's habitats for the future protection of this species:

- *Abies fanjingshanensis* is one of the endemic and important constructive species of Fanjingshan, with continuous distribution, excellent natural condition and best preserved.
- The annual average temperature and effective accumulated temperature in the *Abies fanjingshanensis* distribution area are relatively low, and the trees require a unique climate.
- The species composition under *Abies fanjingshanensis* forest is relatively rich; crown density is low and interlamination bryophyta are rich, which make *Abies fanjingshanensis* unique.
- *Abies fanjingshanensis* belongs to stable growth type which is mainly medium-aged and young trees, whose population is only second to *Abies chensiens* and its endangered situation is serious.

3.2.d.3 Comparison analysis of *Fagus*

For the global distribution of *Fagus* (Figure 3.5), they are distributed in Europe (2 species), North America (1 species, 1 varietas, 1 subspecies) and East Asia (7 species). Qian and Ricklefs (2000) compared the distribution of *Fagus* in North America and East Asia, and found that the number of *Fagus* species in East Asia is two times as large as that of it in North America which the main reason is complex change of terrain and

climate providing opportunities and conditions for species differentiation. This work also proved that China (4 species) and Japan (2 species) are its current distribution and differentiation center (Wang, 2012).

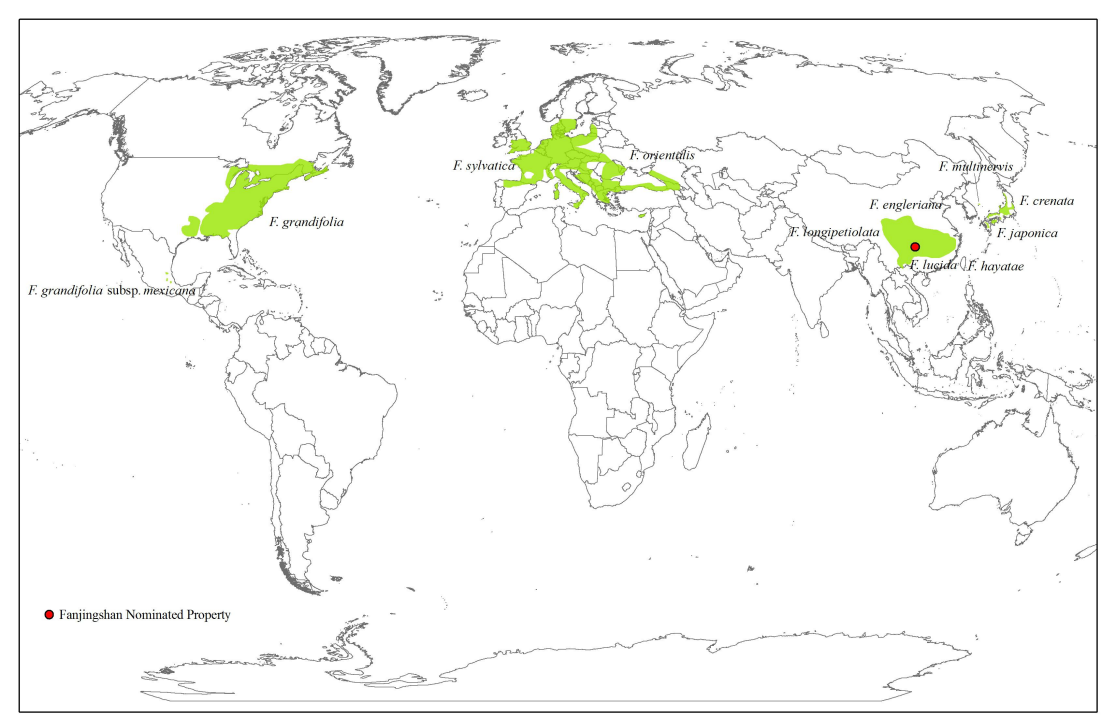


Figure 3.5 Worldwide distributions of *Fagus*

In China, with Qinling Mountains - Huaihe River as the divisional line, there are no *Fagus* distribution tracks in the north, while there are some of them in mountain areas discontinuously in the south. It is worth mentioning that Fanjingshan has retained 3 species of *Fagus* in a large area, which is very rare in the world. And the beech forest distribution influenced by gradient climate changes of the aspect and altitude of the mountain. The changes in the vertical span of *Fagus* forest at an altitude of 1,200m in Fanjingshan have embodied the changes along latitudes within 10 degree in East Asian continent adequately.

Fagus forest in Fanjingshan has a strong original nature since it has grown as mature forest early in the Tertiary Period. Because of the influence of the Quaternary Glacial Period, the distribution area of *Fagus* forest in the subtropical zone was reduced gradually and became discontinuous in mountainous areas. Fanjingshan retained rich species of *Fagus* as a refuge. In Fanjingshan, *Fagus* distributed largely in evergreen and deciduous broad-leaved forest and deciduous broad-leaved forest continuously, and it plays an important role in the control of the ecological system structure and its function and is thus of critical science and protection value.

Fagus community in Fanjingshan has an abundant composition of species that not only contains large quantities of tropical and subtropical genera, also contains some temperate genera, and floristic elements of the community have a tight connection with the tropical flora as well as temperate flora. Among the more than 240 vascular plants, the phaenerophyte account for about 82.79%, the evergreen component accounts for about 76.25%, subtropical character is obvious.

In order to further prove the Outstanding Universal Value and importance of the Fagus in Fanjingshan, 5 World Natural Heritage sites and 12 protected non-heritage sites with typical Fagus forest are chosen to compare with Fanjingshan (Table 3.10).

Table 3.10 Comparison of typical *Fagus* communities all over the world

No.	Name	Attribute	Geographical location	Species	Area(ha)/ Range of Altitude (m)	Community Stratum		References/ Notes
						Layer	Synusia	
1	Fanjingshan (Tentative List Site, China)	Subtropic-al	N27°53′ E108°41′	*Fagus longipetiolata, Fagus lucida, Fagus englerianа*	15,646.5ha/ 946-2,088 m	tree stratum, shrub stratum, herb stratum	evergreen broad-leaved forest; mixed evergreen and deciduous broad-leaved forest; broad-leaved deciduous forest	Editorial board of the Scientific Survey of Fanjingshan, 1982
2	Uholka – ShyrikyiLuh (World Heritage site,Ukraine)	Temperate	N48°18′ E23°41′	*Fagus sylvatica*	1,028,200 ha/ 400-1,300 m	tree stratum	broad-leaved deciduous forest	IUCN official website, 2016; Martina, et al., 2015
3	Hainich (World Heritage site, Germany)		N51°4′ E10°26′	*Fagus sylvatica*	1,573.4 ha/ ≥350 m	tree stratum	broad-leaved deciduous forest	Mölder, et al., 2009
4	Serrahn (World Heritage site, Germany)		N53°20′ E13°12′	*Fagus sylvatica*	330 ha/ ≥100 m	tree stratum	mixed coniferous and broad-leaved forest	Oheimb, et al., 2005
5	Hyrcanian forests (Non-Heritage site, Iran)		N36°32′ E51°47′	*Fagus orientalis*	503ha/ 700-2,000 m	tree stratum	broad-leaved deciduous forest	Saghebtalebi, Schutz,2002; Ahmadi, et al., 2013
6	Boisé-des-Muir Ecological Reserve (Non-Heritage site, Canada)		N45°5′ W74°7′	*Fagus grandifolia*	11 ha/ ≤77m	tree stratum	broad-leaved deciduous forest	Beaudet, et al., 2007

7	Naushon Island (Non-Heritage site, America)		N41°28′ W70°47′	*Fagus grandifolia*	1,052 ha/ ≤36m	tree stratum	broad-leaved deciduous forest	Busby, 2008
8	Sierra Madre Oriental (Non-Heritage Site, Mexico)	Subtropic-al	N19°41′ W96°51′	*Fagus grandifolia* subsp. *mexicana*	40 ha/ 1,840-1,900 m	tree stratum	broad-leaved deciduous forest	Alvarez-Aquino C, Williams-Linera G, 2002
9	Shirakami Sanchi (World Heritage site, Japan)	Temperate	N40°28′ E140°6′	*Fagus crenata, Fagus japonica*	16,939ha/ 200-1,400 m	tree stratum, herb stratum	mixed evergreen and deciduous broad-leaved forest; broad-leaved deciduous forest	Nobuhiro, et al., 1997; TukasaHukusima, et al., 2013; Wang, et al., 2003
10	Mt.Seonginbong (Non-Heritage Site, South Korea)		N37°30′ E130°46′	*Fagus multinervis*	3,100ha 350-820m	tree stratum, herb stratum	broad-leaved deciduous forest	Tomoshi et al., 2006; TukasaHukusima, et al.,2013
11	Hubei Shennongjia (World Heritage site, China)	Subtropic-al	N31°19′ E110°29′	*Fagus lucida, Fagus englerian a, Fagus hayatae*	— / 900-1,830 m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest; deciduous broad-leaved forest	Zhang, et al., 2003; Li T, et al., 2009; IUCN official website, 2015;
12	Dabashan (Non-Heritage Site, China)		N30°50′-33°05′ E106°10′-110°10′	*Fagus englerian a*	— / 1,700-2,100m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest	Xiong, 2007
13	Badagongshan National Nature Reserve (Non-Heritage Site,China)		N29°45′ E110°01′	*Fagus lucida*	6,670ha/ 1,200-1,890m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest	2013 Cao, et al., 1997; Lu, et al., 2013
14	Lala Mountain (Non-Heritage Site, Taiwan, China)		N24°41′-24°51′ E121°23′ -121°30′	*Fagus hayatae*	268 ha/ 1,300-2,030 m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest	Hukusima et al., 2005; Wang, et al.,1996
15	Dalaoling National Forest Park (Non-Heritage Site, China)		N30°00′ -31°04′ E100°52′ -111°00′	*Fagus englerian a, Fagus lucida*(companion species)	— / 1,250-2,000m	tree stratum, shrub stratum,	evergreen and deciduous broad-leaved forest; mixed broadleaf-co	Shen et al., 2000

						herb stratum	nifer forest	
16	Kuankuoshui National Nature Reserve (Non-Heritage Site, China)		N28°6′-28°19′ E107°2′-107°14′	*Fagus lucida*	1,300ha/1,400-1,750 m	tree stratum, shrub stratum, herb stratum	deciduous broad-leaved forest	TukasaHukusima, et al., 2013; Guizhou Forestry Survey and Planning Institute, 2007
17	Qingliangfeng National Nature Reserve (Non-Heritage Site, China)		N30°05′-30°17′ E118°52′-119°11′	*Fagus hayatae*	— / 970-1,040 m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest; deciduous broad-leaved forest	Weng, et al., 2009
18	Sanjiangkou Nature Reserve (Non-Heritage Site, China)		N 28°09′-28°14′ E103°53′-104°01′	*Fagus lucida, Fagus englerian a*	— / 1,600-2,400m	tree stratum, shrub stratum, herb stratum	evergreen and deciduous broad-leaved forest; deciduous broad-leaved forest	Dai, et al., 2011

- Data missing

Comparative analysis conclusions

- *Fagus* forest in Fanjingshan is the most typical representative of the *Fagus* in the subtropical zone, and it will fill a gap among global beech forests across a World Heritage series distributed in the subtropical zone. *Fagus* forest in Fanjingshan warrants equal protection is the same as that of the similar one but which distributed in the north edge of subtropical region and the evergreen component of it accounts for 17.02% in Shennongjia and cold temperate *Fagus* forests in Europe and Japan. Compared with the North American subtropical *Fagus* distribution area, which is discontinuous and has decreased year by year because of the effects of hurricanes, Fanjingshan is the largest, the most concentrated and ideal distribution area of *Fagus* that provides a key place for research on global *Fagus* migration process and the evolution history of primitive subtropical *Fagus* communities.

- Fanjingshan is one of *Fagus*'s modern diversity and global differentiation centers. There are 4 species of *Fagus* in China, Fanjingshan and Shennongjia each have 3 species while most of the selected comparative sites have 1 or 2 species. Compared with the secondary beech forest that had been destroyed by human activities seriously in Shennongjia, *Fagus* forest in Fanjingshan has very aboriginality, and through long geological evolution since the Eocene, it has been

saved and displayed perfectly by way of alpine effects in a small region.

- Compared with selected comparative sites, the distribution area of *Fagus* forest in Fanjingshan (15,646.5 ha), which is the largest distribution area of known subtropical *Fagus* forest in the world, is second only to Shirakami Sanchi which is famous for cold temperate *Fagus* (16,939 ha). Although the vertical span of *Fagus* forest in Fanjingshan (946-2,088 m) is second to Hyrcanian forests in Iran (700-2,000 m), it exhibits the level distribution characteristics along latitudes within 10 degree of the East Asian subtropical *Fagus* forests impressively in a vertical span of nearly 1,200 m.

- *Fagus* forest in Fanjingshan spans more abundant vegetation types than other selected comparative sites. The vegetation types contain evergreen broad-leaved forest, evergreen and deciduous broad-leaved mixed forest and deciduous broad-leaved forest, and its upper limit partially permeates to subalpine coniferous and broad-leaved forest. *Fagus* forest in other selected comparative sites has only 1 or 2 vegetation types.

- As the most typical representatives of subtropical *Fagus* forests, *Fagus* forest in Fanjingshan not only has more *Fagus* species, but also has enriched evergreen plants of the global *Fagus* communities. It is the genus historical miniature for the changed environment, is also the outstanding example of development and succession of subtropical *Fagus* forests. The dominant *Fagus* species of Fanjingshan are *Fagus lucida* and *Fagus longipetiolata*, which their canopy own abundant of evergreen elements showing Double-Peak distribution because of the change of seasons and their forest understory include many evergreen species, while the other selected comparative sites only have single dominant Fagus species with *Fagus sylvatica*, *Fagus orientalis*, *Fagus grandifolia*, *Fagus crenata*, *Fagus hayatae* or other *Fagus* species, which have few evergreen species of forest understory.

3.2.d.4 Comparison of moss

Fanjingshan is located in the subtropical zone. Given the ecological context of the nominated property it has been compared with 12 Chinese World Natural Heritage sites, Tentative List Sites and Non-Heritage sites according to the richness and levels of endemism among mosses (Table 3.11).

Table 3.11 Comparison of moss plants in subtropical zone

No.	Name	Criteria	Geographical location	Area(ha)/ Range of Altitude (m)	Number of species	Number of endemic species	Floristic features	References /Notes
1	Fanjingshan (Tentative List Site)	(vii) (ix)(x)	N27°53′ E108°41′	40,275ha/ 500-2,570 m	791	75	The main floristic composition is the eastern Asia element (38.2%), the tropical element (21.91%) and temperate element (24.34%) has the same proportion. There are 75 endemic species. The characteristic of floristic composition is transited north to south.	The Editorial Committee of Fanjingshan, 2013
2	Mount Taishan (World Heritage site)	(i)(ii) (iii)(iv) (v)(vi) (vii)	N36º16′ E117º5′	25,000ha/ 200-1,545 m	162	12	The proportion of holarctically floristic composition is 96.5%. The main floristic compositions of holarctically floristic composition are Europe, Asia, North America element (45.4%) and East Asia element (32.6%). The obvious characteristics of floristic composition are with eastern Asian element; especially extremely close relationship with Japan, Korea in floristic element.	Zhao, 2003
3	Mount Huangshan (World Heritage site)	(ii)(vii) (x)	N30º10′ E118º10′	16,060ha/ 600-1,864 m	518	42	The main floristic compositions of hepaticae are with tropical element and eastern Asian element, accounting for 40% and 39.09% respectively. The proportion of temperate element is 20%. The proportion of moss with East Asia element is 37.82%, in temperate element is 35.13%, and in tropical and subtropical element is 26.75%. That shows the mountain is located in transitional tropical zone, subtropical elements extending northward and temperate elements infiltrated southward.	Shi, 2009; Wu, 2010
4	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (World Heritage site)	(iv)(vi) (x)	N29º32′ E103º46′	15,400ha/ 500-3,099 m	402	35 (Musci)	The main floristic composition is eastern Asian element (32.21%). The proportion of temperate element is 21.17% and the proportion of tropical element is 18.10%.	Pei, 2006
5	Mount Wuyi (World Heritage site)	(ii)(vi) (vii)(x)	N27º43′ E117º40′	99,975ha/ 350-2,158 m	355	—	The main floristic composition of moss is with eastern Asia element and palaeo-tropically floristic	Wu, 1987

							composition is rich. The floristic composition is similar to holarctically floristic composition, and the proportion of the similarity is 26.8%. The characteristic of floristic composition is transited north to south. Endemic species are little.	
6	South China Karst-Jinfoshan (World Heritage site)	(vii)(viii)	N28º46′-29º38′ E106º54′-107º27′	26,000ha/ 340-2,251 m	375	28	The main floristic composition is with eastern Asia element (33.77%), second temperate element (28.57%) and tropical, subtropical element (24.68%).	Hu, 1991
7	Mount Sanqingshan National Park (World Heritage site)	(vii)	N28°48′-29°00′ E117°58′-118°08′	22,950ha/ 200-1,816 m	368	—	—	Mount Sanqingshan National Park World Heritage text, 2008
8	Hubei Shennongjia (World Heritage site)	(ix)(x)	N31º22′-31º37′ E110º34′-113º03′	90,000ha/ 480-3,105 m	258	27	The holarctically floristic element (71.32%) is rich. The tropical, subtropical element (16.17%), eastern Asia element (7.35%) and endemic to China (0.74%) are little.	Tian, 1998; Liu, 1999
9	The Hengduan Mountains (Non-Heritage Site)		N25º50′-34º30′ E96º50′-104º40′	36,400,000ha /2,000-6,700m	934	88	The Mountains are the largest distribution center of specific Bryophyte in eastern Asia, where concentrated distribution more than 2/3 endemic to eastern Asia and endemic to China. About 1/3 endemic to eastern Asia just distributed in this area.	Wang, 2009; Wu, 1994
10	Qinling Mountain (Non-Heritage Site)		N32°22′-34°40′ E105°29′-111°01′	57,228ha/ 1,500-3,767m	590	—	Located at the northern edge of the subtropical distribution of Bryophyte. The majority of floristic composition is holarctically. Temperate element (44.44%) of hepaticae is the highest compared with others. Secondly, eastern Asia element (21.46%) and tropical Asia element (12.64%). Endemic in China were also abundant. The composition of Bryophytes in this area was relatively simple and the extent of differentiation is not high.	Zhang, 1985; Chen, 2008; Pan, 2013
11	Mount Dinghu (Non-Heritage Site)		N23°09′-23°11′ E112°30′-112°33′	1,155ha/ 14.1-1,000.3m	187	—	The tropical elements play dominant role occupying about 26.82%, and the next is the East Asian elements, accounting for 25.70%.The nature of bryoflora of Dinghushan is of tropical	Fang & Huang, 2015

							obviously as the total Tropical patterns occupying 99 species (55.31%). In addition, Dinghushan also plays a transition zone between the tropical and the temperate.	

* Select the typical sites of species diversity from the series of sites - Data missing

Comparative analysis conclusions

- The number of bryophyte and endemic species in Fanjingshan is just less than that in Hengduan Mountains. And the density of bryophytes in Fanjingshan is higher than that in the Hengduan Mountains. Fanjingshan is an important distribution center of bryophytes.
- The endemic species of moss in China are mainly distributed in the Hengduan Mountains, Jinfoshan and its adjacent areas and Mount Huangshan, Mount Xitianmu in China extending to Taiwan (Wu, 2006). Fanjingshan is adjacent to Jinfoshan, and has a remarkable 75 species of moss endemic to China, but only 6 species are the same as those endemic to China in Jinfoshan; 15 species and 16 species are the same as those endemic to China in the Hengduan Mountains and Mount Huangshan, respectively. This shows that Fanjingshan is an important distribution center of the species of moss endemic to China and has important value for the study of the evolution of moss.
- The bryophyte elements in Jinggangshan-North Wuyishan are mainly tropical and subtropical; those in the Hengduan Mountains, Qinling Mountain and Mount Taishanare are dominated by temperate elements. Fanjingshan is located between Jinggangshan-North Wuyishan and Mount Taishan, so the tropical and temperate elements of bryophytes have the similar proportion and it becomes an important differentiation center of bryophyte transiting from the south to the north.

3.2.d.5 Comparative analysis of plant diversity

Table 3.12 Comparison of plant diversity in the same biogeographical province

No.	Name	Criteria	Geographical position	Area(ha) /Altitude (m)	Number of species of higher plants (species/ genus)	Angiosperm (species /genus)	Gymnosperm (species /genus)	Pteridophyta (species /genus)	Bryophyte (species/genus)	Reference/ Notes
1	Fanjingshan (Tentative List Site, China)	(vii) (ix) (x)	N27°53′ E108°41′	40,275ha /500-2,570 m	3,724	2,548	36	349	791	The editorial committee of Fanjingshan study, 1990; The editorial committee of Fanjingshan bryophyte, 2013

2	Mount Huangshan (World Heritage site, China)	(ii) (vii) (x)	N 30º10′ E118º10′	16,060ha /600-1,864 m	1,807	1,465	18	131	191	Mount Huangshan scenic area master plan (2007-2025). , 2006
3	Mount Wuyi (World Heritage site, China)	(ii) (vi) (vii) (x)	N 27º43′ E117º40′	99,975ha / 350-2,158 m	2,888	2,222	25	286	355	UNESCO, 2001;Zhang, 2008
4	Wulingyuan Scenic and Historic Interest Area (World Heritage site, China)	(vii)	N 29°19′ E110°30′	26,400 ha /-	2,124	1,613	17	256	238	UNESCO, 2015; The first round of regular reports of Wulingyuan Scenic and Historic Interest Area, 2002
5	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (World Heritage site, China)	(iv) (vi) (x)	N 29º32′ E103º46′	15,400ha /500-3,099 m	3,229	2,375	27	425	402	The nomination file of Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Arean, 2010; Pei, 2006
6	South China Karst-Jinfoushan Mountain (World Heritage site, China)	(vii) (vii)	N 28°46′ -29°38′ E106°54′ -107°27′	26,000ha /340-2,251 m	2,367	1818	17	157	375	The nomination file of South China Karst, 2014; Hu, 1991
7	Mount Sanqingshan National Park (World Heritage site, China)	(vii)	N 28°48′ -29°00′ E117°58′ -118° 08′	22,950ha /200-1,816 m	2,225	1,629	15	213	368	UNESCO, 2015; The nomination file of Mount Sanqingshan National Park, 2008
8	China Danxia; China-Longhushan Mountain (World Heritage site, China)	(vii) (vii)	N 28°25′ E 106°2′	27,364ha /240-1,730 m	1,777	1,593	30	148	-	The nomination file of China Danxia; China, 2010
9	Shirakami-Sanchi (World Heritage site, Japan)	(ix)	N 40°28' E140°07'	16,971ha /300-1,243 m	540	-	-	-	-	UNESCO, 2015
10	Hubei Shennongjia	(ix) (x)	N 31º22′ -31º37′	67,087ha /480-3,10	3,644	3,038	33	315	258	UNESCO, 2015; The

	(Tentative List Site, China)		E110º34′ -113º03′	5 m						nomination file of Hubei Shennongjia, 2015
11	Jinggangshan-North Wuyishan (Extension of Mount Wuyi) (Tentative List Site, China)	(iii) (vi) (vii) (x)	N 26°30′ -27°56′ E114°05′ -117°47′	63,575ha /200-2,120 m	2,988	2,500	16	300	172	The nomination file of Jinggangshan-North Wuyishan, 2015; Chen, 2012
12	Tianzhushan (Tentative List Site, China)	(ii) (iii) (v) (vi) (vii) (viii)	N30°35′ - 30°47′ E116°21′ -116°31′	33,802ha /1488m	1,650	973	18	-	-	The nomination file of Tianzhusha, 2015; China forestry network, 2016
13	ShuDao (Tentative List Site, China)	(ii) (iii) (iv) (vi) (vii) (x)	N 32º11′ E105º32′	36,270ha /-	1,045genus	853 genus	21 genus	75 genus	96 genus	The nomination file of ShuDao, 2015
14	Yandang Mountain (Tentative List Site, China)	-	N 28°38′ E121°08′	About 5,4000ha	1,395	-	-	147	-	UNESCO, 2015; Li, 2005
15	Mt. Kumgang and the Historical Relics in and around (Tentative List Site, Democratic People's Republic of Korea)	(vii) (vi) (x)	N 38°37′ E126°04′	16,360 ha /The main peak 1,638m	2,256	-	-	-	-	UNESCO, 2015
16	Mt Soraksan Nature Reserve (Tentative List Site, Republic of Korea)	(vii) (vi) (x)	N 38°37' E126°04′	38,600 ha /The main peak 1,708m	822	-	-	-	-	UNESCO, 2015
17	Mount Dinghu(Non-Heritage Site, China)		N23°09′ -23°11′ E112°30′ -112°33′	1,155ha/ 14-1,122 m	2,180	1,822	23	148	187	Mount Dinghu National Nature Reserve, 2016

* Select the typical sites of species diversity from the series of sites - Data missing

Comparative analysis conclusions

Fanjingshan's higher plants have the most abundant number of species, and the number of bryophyte species is significantly higher than other comparable sites. As for the gymnosperm species, the number found in the nominated property is the most. Furthermore, the number of angiosperm species only ranks after Shennongjia. Similarly, the number of pteridophyta species in Fanjingshan is just less than those in Mt.Emei-Leshan Giant Buddha. Thus, it can be seen that Fanjingshan's species diversity of plant possesses outstanding value in the same biogeological province.

3.2.d.6 Comparative analysis of animal diversity

Table 3.13 Comparison of animal diversity in the same biogeographic province

No.	Sites	Criteria	Geographical location	Area (ha) / Range of Altitude (m)	Total	Mammals	Birds	Reptiles	Amphibians	Fresh water Fish	Reference / Notes
1	Fanjingshan (Tentative List Site,China)	(vii) (ix) (x)	N 27°53′ E 108°41′	40,275 ha/ 500-2,570 m	450	80	224	43	43	60	Guizhou Provincial Forestry Department, 1987; Comprehensive Scientific Survey Report of Yangxi Nature Reserve, 2015
2	Mount Huangshan (World Heritage site, China)	(ii) (vii) (x)	N 30°10′ E 118°10′	16,060 ha/ 600-1,864 m	300	48	170	38	20	24	UNESCO, 2015
3	Mount Wuyi (World Heritage site, China)	(ii) (vi) (vii) (x)	N 27°43′ E117°40′	99,975ha/ 350-2,158 m	475	71	256	73	36	40	UNESCO, 2016
4	Wulingyuan Scenic and Historic Interest Area (World Heritage site, China)	(vii)	N29°19′ E110°30′	26,400 ha/	176	43	70	24	19	20	UNESCO, 2015; Periodic Report of Wulingyuan, 2002
5	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (World Heritage site,	(iv) (vi) (x)	N 29°32′ E 103°46′	15,400 ha/ 500-3,099 m	434	51	256	34	33	60	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area World Heritage text,

	China)										2010
6	South China Karst-Jinfoshan* (World Heritage site, China)	(vii) (viii)	N 28°46′-29°38′ E106°54′ - 107° 27′	26,000 ha/ 340-2,251 m	307	61	168	31	28	19	Jinfoshan World Heritage text, 2014
7	Mount Sanqingshan National Park (World Heritage site, China)	(vii)	N 28°48′-29°00′ E117°58′ - 118° 08′	22,950 ha/ 200-1,816 m	401	67	226	49	23	36	UNESCO, 2015; Mount Sanqingshan National Park World Heritage text, 2008
8	China Danxia -Longhushan * (World Heritage site, China)	(vii) (viii)	N 28°25′ E 106°2′	27,364ha/ 240-1,730 m	223	29	112	28	25	29	Longhushan World Heritage text, 2010
9	Shirakami-Sanchi (World Heritage site, Japan)	(ix)	N 40°28' E 140°07′	16,971 ha/ 300-1,243 m	—	87	—	—	—	—	UNESCO, 2015
10	Hubei Shennongjia(World Heritage site, China)	(ix) (x)	N 31º22′-31º37′ E110º34′-113º03′	90,000 ha/ 480-3,105 m	509	87	289	51	36	46	UNESCO, 2016
11	Tianzhushan (Tentative List Site, China)	(ii) (iii) (v) (vi) (vii) (viii)	N 30°35′-30°47′ E116°21′ - 116°31′	33,802 ha/The main peak of 1,488 m	＞300	40	87	—	—	—	Tianzhushan World Heritage text, 2015; China forestry network, 2016
12	ShuDao (Tentative List Site, China)	(ii) (iii) (iv) (vi) (vii) (x)	N 32º11′ E 105º32′	36,270 ha/	462	101	264	38	27	32	ShuDao World Heritage text, 2015
13	Yangdang Motainun (Tentative List Site, China)	—	N 28º38′ E 121º08′	—	—	—	293	—	—	—	Li, 2005
14	Mt. Kumgang and the Historical Relics in and around the Mountain (Tentative List Site,	(vii) (vi) (x)	N 38°37′ E 126°04′	16,360 ha/	217	38	130	9	10	30	UNESCO, 2015

	Democratic People's Republic of Korea)										
15	Mt. Soraksan Nature Reserve (Tentative List Site, Republic of Korea)	(vii) (x)	N 38°37' E 126°04′	38,600ha/ The main peak of 1,708 m	—	—	—	—	—	—	—
16	Mount Dinghu(Non-Heritage Site, China)		N23°09′-23°11′ E112°30′-112°33′	1,155ha/ 14-1,000m	273	38	196	30	9	-	Xu, 2000; Xu, 2001

* Select the typical sites of species diversity from the series of sites. - Data missing.

Comparative analysis conclusions

- Fanjingshan has 450 species of vertebrate animals, and this quantity is only less than that in Shennongjia Nature Reserve and ShuDao. The area of the Shennongjia Nature Reserve is much larger than that of Fanjingshan and directly connected to the even larger Daba Mountain range; the area of ShuDao is smaller, but the shape of nominated property is long, crossing 18 districts in 6 cities. It is difficult to be sure whether a species is located within the nominated property or not; the vertebrate species per unit area of the nominated property are rich in Fanjingshan.
- Fanjingshan has 43 kinds of amphibians and 60 kinds of freshwater fish, both ranking in first place across all the sites compared here. This is due to the radial nature of its extensive river system which connects to several different river catchments.

3.2.d.7 Comparison with Hubei Shennongjia World Heritage site

Table 3.14 Comparison with Hubei Shennongjia World Heritage site

	Fanjingshan	Hubei Shennongjia
Criteria	—	(ix)(x)
Latitude and longitude	N27°53′44″, E108°40′48″	Laojunshan：N31°27′47″, E110°30′33″ Shennongding：N31°28′51″, E110°13′49″
Property (ha)	40,275	67,087
Altitude (m)	2,570	3,106.2
Climatic zone / Climatological type	Mid subtropical / Humid monsoon climate	North subtropical / Humid monsoon climate
Temperature	Annual average temperature varies from 5 to17℃	Annual average temperature varies from 12 to17℃
Precipitation	Annual precipitation varies from	Annual precipitation varies from 700 to

	1,100 to 2,600 mm	2,700 mm
Mountain vertical climatic zone	Mid subtropical, North subtropical, South temperate zone, Mid temperate zone	North subtropical, Warm temperate zone, Temperate zone, Cold temperate zone
Geomorphological Features	Located in the southwest margin of the Jiangnan Orogenic belt, it is a rift basin in Proterozoic Eon; is a non-karst faulted dome of mountain, which is higher than its surrounding karst area	Belongs to the Upper Yangtze platform of the Yangtze Paraplatform. The area spreads across two third-order tectonic units of the Daba-Dahong mountain platform and the Central Hubei fold belt; is a dome-shaped anticline mountain
Independence of ecosystem	Main peak of Wulingshan range without great mountains adjacent, surrounded by karst hilly, system is relatively independent	Belongs to the middle of Daba mountains, more contact with Qinling mountains
Habitat types	Forest, Shrubland, Grassland, Wetlands(Rivers & Swamps), Rocky barren areas, Caves & Subterranean	Forest, Shrubland, Grassland, Wetlands(Rivers), Rocky barren areas, Caves & Subterranean
Main vegetation types	Evergreen broad-leaved forest, evergreen and deciduous broad-leaved mixed forest	Evergreen and deciduous broad-leaved mixed forest, deciduous broad leaved forest
Main community types	*Fagus* community	*Quercus* community and *Fagus* community
Vegetation vertical bands	Subalpine scrub meadow; Subalpine dwarf forest; Subalpine coniferous forest; Deciduous broad-leaved forest; Evergreen- deciduous broad-leaved forest; Evergreen broad-leaved forest	Cold temperate subalpine shrub meadow; Cold temperate coniferous forest; Temperate coniferous forest; Warm temperate deciduous broad-leaved forest; North subtropical evergreen deciduous broad-leaved forest; Subtropical evergreen broad-leaved forest
Terrestrial ecoregion	Guizhou plateau broadleaf and mixed forest	Daba Mountain evergreen forests
Terrestrial realm-biome combination	Tropical and subtropical moist broadleaf forests	Temperate broadleaf mixed forests
Terrestrial Global 200 priority ecoregion	Southeast China-Hainan moist forests	Southwest China temperate Forests
Endemic Bird Areas	140 Chinese subtropical forests, 141 South-east Chinese mountains	141 South-east Chinese mountains
Main protected animals/ quantity	*Rhinopithecus brelichi* / about 750	*Rhinopithecus roxellana hubeiensis* / about 1,200
Quantity of higher plant species	3,724	3,644
Quantity of local endemic plant	46/858	205/1,719

species / endemic plant species of China		
Quantity of protected plant species/ endangered plant species	47(excluding Orchidaceae)/230	163(including 91 kinds of Orchidaceae plants)/229
Quantity of Bryophytes plant species	791	258
Quantity of local Bryophytes plant species / endemic Bryophytes plant species of China	1/74	0/27
Quantity of Gymnospermae plant species	36	33
Quantity of local Gymnospermae plant species / endemic Gymnospermae plant species of China	1/20	0/20
Typical species of Gymnosperms	*Abies fanjingshanensis*, *Pseudolarix amabilis*, *Cathaya argyrophylla*, *Keteleeria pubescens*, *Pinus taiwanensis*, *Pinus thunbergii*, *Tsuga longibracteata*, *Podocarpus neriifolius*, *Torreya grandis*	*Juniperus pingii* var. *wilsonii*, *Abies chensiensis*, *Abies fargesii*, *Picea brachytyla*, *Picea neoveitchii*, *Picea wilsonii*, *Pinus tabuliformis*, *Pinus taiwanensis*, *Torreya fargesii*
Quantity of Mammal species	80	87
Quantity of local Mammal species / endemic Mammal species of China	3/13	—/17
Quantity of protected Mammal species/ endangered Mammal species	17/48	15/41
Quantity of Aves species	224	389
Quantity of local Aves species / endemic Aves species of China	0/5	—/10
Quantity of protected Aves species/ endangered Aves species	26/32	64/84
International threatened birds	*Syrmaticus ellioti* *Syrmaticus reevesii*	*Gorsachius magnificus* *Syrmaticus reevesii*
Quantity of Reptiles species	43	51
Quantity of local Reptiles species / endemic Reptiles species of China	0/14	—/16
Quantity of protected Reptiles species/ endangered Reptiles species	0/12	0/15
Quantity of Amphibians species	43	36

Quantity of local Amphibians species / endemic Amphibians species of China	1/18	—/14
Quantity of protected Amphibians species/ endangered Amphibians species	1/13	2/12
Quantity of Pisces species	60	46

Comparative analysis conclusions

- Fanjingshan and Shennongjia belong to the same biogeographic province but the different geographical position. Fanjingshan is located in the mid subtropical. Shennongjia is located in the north subtropical; they have different biota and ecological importance. Lots of factors such as landscape and climate caused obvious differences in mountain vertical climatic zone, vegetation vertical bands, main vegetation types and the main community types. Fanjingshan has a relatively independent ecological system and an ancient geological history which formed ecological process, two main vegetation types are evergreen broad-leaved forest and mixed evergreen and deciduous broad-leaved forest (mainly *Fagus* forests), both of them develop together, which is an outstanding representative of the transition from subtropical humid evergreen broad leaved forest to temperate deciduous broad-leaved forest, at the same time, a prominent example in the process of biological evolution in the south Oriental Deciduous Forest Biogeographical province. Shennongjia provides a vital source of global temperate flora and the highest concentration of global temperate genera, the main vegetation is deciduous broad leaved forest. Shennongjia is typical representative of the transition from mixed evergreen and deciduous broad-leaved forest to the temperate deciduous broad-leaved forest, meanwhile, a prominent example of the process of biological evolution in the Oriental Deciduous Forest Biogeographical province.
- Fanjingshan is the most critical and unique habitat for *Rhinopithecus brelichi* and *Abies fanjingshanensis*, an important locality for Bryophyte differentiation and development, an important place for endemic animals and plants, the highest global concentration of the *Fagus* genera.
- Shennongjia shares several similarities with Fanjingshan and is main habitat for *Rhinopithecus roxellana hubeiensis*, rich in rare and endangered endemic plant species and model, is the richest number of deciduous woody species in the world. Fanjingshan has more bryophytes species, gymnosperms, amphibians and fish

species, but less birds, mammals and reptiles than Shennongjia. The two sites have similar richness in higher plants but species similarity runs at less than 50% and Fanjingshan differs in having more tropical genera and more westerly relationships among its temperate genera.

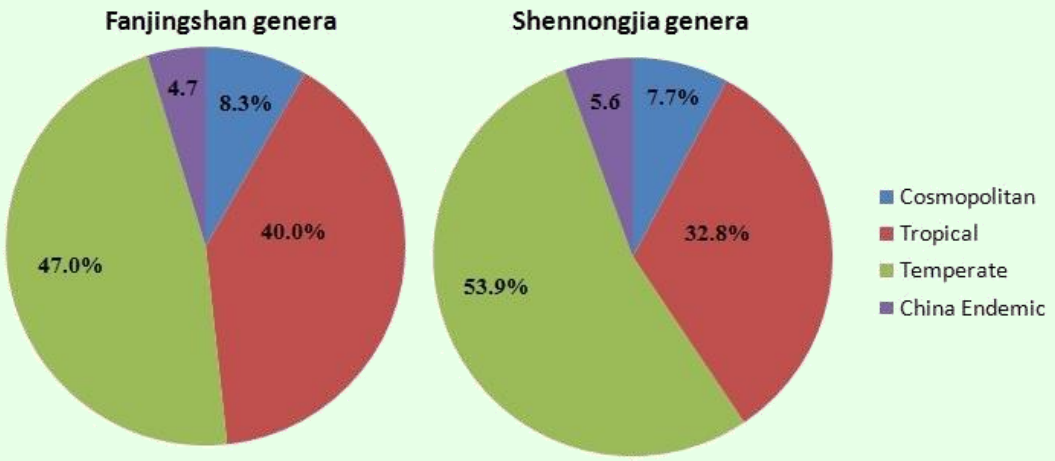


Figure 3.6 Comparison of the quantity between Fanjingshan and Shennongjia

- Fanjingshan is located in one of the six gymnosperm plant species richness centers of Yunnan-Guizhou-Guangxi and the South Mountain Ranges (Li, 2009), in addition to special metamorphic islands, lots of gymnosperm plant species aggregation here such as model specimen plant *Tsuga longibracteata* and endemic plant *Abies fanjingshanensis* and these make Fanjingshan unique and quite distinct from the gymnosperm flora of Shennongjia which has more obvious temperate properties dominated by such typical species as *Picea* and *Abies fargesii* that are common in boreal coniferous forests further north.

3.3 Proposed statement of Outstanding Universal Value

a) Brief synthesis

The nominated property of Fanjingshan, with an area of 40,275 ha and a buffer zone of 37,239 ha, is located in Guizhou Province in Southwest China. It is situated in the transitional zone from the Yunnan-Guizhou Plateau towards the Western Hunan Hills. In the nominated property, Fenghuangshan Peak which is the main peak of the Wulingshan Range in China is 2,570 m in altitude, giving the property a vertical elevation range of more than 2,000 m. It forms the upper watersheds of the Wujiang and Yuanjiang Rivers. The nominated property is in the Oriental Deciduous Forest biogeographic province, as defined by Udvardy, and in the middle of the subtropical zone, influenced by the Indian

Ocean monsoon from the southwest, the Pacific Ocean monsoon from southeast and northwest cold air flows. Therefore, Fanjingshan exhibits transitional features from the south subtropical and north subtropical zones of China. Its climate is mild with relatively high levels of precipitation. The nominated property displays pronounced mountain vertical climate zone, and it provides shelter and spatial evolution for many relict, endemic and endangered species.

Physically, the nominated property is a great dome of metamorphic rocks surrounded by the Fengcong karst plateau in Southwest China. The geological age of this area is over 1 billion years. In the early Proterozoic, Fanjingshan rock was formed by volcanic movements in oceanic plates. After more than 700 million years in the Triassic Period, Fanjingshan's rock base was immersed in an ancient ocean. It was covered by carbonate sediments with a thickness up to six kilometers. From late Triassic to Jurassic, Fanjingshan was uplifted and became dry land with the great thickness of the seabed sediment. When the India plate and Eurasian plate collided during the Jurassic Period again, the land was raised to a karst plateau, and it was gradually revealed in the lime rock layer, affected by erosion effect, and formed its dome mountain ladder structure. Along with the rapid uplift of the Qinghai-Tibetan Plateau in the Pleistocene, it was eventually emerged like a huge island from the “ocean” of the surrounding karst hills. Karst strata of the peripheral Fanjingshan were further eroded by high rainfall. The landscape of the nominated property is a record of large-scale tectonic movements that East Asia has experienced since the Paleozoic Era, resulting in the living communities which are a kind of Noah's Ark of ancient relict species. Fanjingshan became a shelter for Tertiary paleo plants, affected by the geological movement and climate change during the Tertiary and Quaternary periods. It possesses a unique and diverse ecosystem characterized by species of differing geologic and climatic origins.

The nominated property belongs to the core zone of Himalayan - Japanese flora located in the mid-subtropical zone. It exhibits both tropical and temperate characteristics in equal measure as well as elements of the floristic transition from the tropical to temperate zone. In this ecological context, the nominated property, in a relatively compact area, hosts more than 3,000 species of vascular plants and more than 2,000 species of animals. It is one of the most diverse hot spots for species in the Oriental Deciduous Forest biogeographic province and has irreplaceable value for in-situ conservation of endangered species providing critical habitats for species such as *Rhinopithecus brelichi* and *Abies fanjingshanensis*.

Fanjingshan carved through the ages a unique combination of rare beauty: peculiar peaks and weathered stone features, pristine rivers and waterfalls, thick forest and

stunning wildflower displays all enveloped by dynamic metrological phenomena. The wealth of diverse natural beauty in Fanjingshan profoundly impacts on the human experiences in the place. It has inspired spiritual beliefs, and holds a special place as a famous Chinese Buddhist region.

In summary, East Asian plate tectonic movements and Tertiary and Quaternary period climate change have combined to leave a huge and distinctive mark on this nominated property which can be clearly seen on the earth's surface. Fanjingshan retained an extremely rich biodiversity in the process, and today it remains a vital refuge for many ancient relict, rare, endangered and endemic species. The mountains, rock forms, forests, water bodies, weather effects and other natural elements, together with the long-term evolution of dynamic changes in Fanjingshan, have provided the foundation for this beautiful awe-inspiring landscape.

b) Justification for criteria

Criterion (vii)

Fanjingshan's outstanding aesthetic value derives from its great diversity of landscapes, which exceeds that of many other natural sites. The nominated property exhibits a rare and superlative combination of spectacular geologic features and landforms, scenic mountains, wonderful panoramas, jewel like wetlands, spectacular waterfalls, varied high quality forests, unusual meteorological phenomena and wildlife spectacles.

Fanjingshan's size and elevation range result in that the landscapes are very different from the bottom to the top of the mountain. The valleys and gorges alternate with the mountains, developing many steep knife-like ridges, shaded by evergreen forests. In the valleys, rocks, cliffs, peaks and column landscapes have developed on the outcropping metamorphic detrital rocks. At the top of the mountain, there are peculiar stone peaks, which offer astonishing views and highlight a spectacular landscape of many distant and steep mountains. Some of the peak bases are broken, and some have collapsed, leaving only a lonely isolated peak, which appears to the human eye as if defying gravity. The rivers of Fanjingshan spread radially from the top of mountain, a phenomenon locally known as the "99 rivers". These rushing watercourses manifest in diverse water features and many stunning waterfalls. The landscape provides a canvas for the rich flora and fauna, which provide a great range of pleasing biotic landscapes. Especially admired are the beautiful butterflies, vibrant pheasants and many ornamental plants, such as Rhododendron, Chinese dove tree *Davidia involucrata*, Chinese little leaf box (*Buxus*), *Abies*, hemlock *Tsuga chinensis* and *Juniperus squamata*.

The aesthetic qualities of the nominated property are heightened by constantly changing weather landscapes, including seasonal and daily weather variations. These add a dimension to the human response to this landscape for example through phenomena such as cloud seas, rainbows, mirages and the spiritually important “Buddha light” bought about instantaneous changes of the moving air.

A part of Fanjingshan’s beauty also relates to the stark seasonal contrasts, which express themselves in the vertical vegetation zones and differing geographical contexts. Depending on the elevation there are different forest landscapes consisting of distinct beautiful plant groups, especially the flowering plants such as the delicate *Davidia involucratal*, stately Firs (*Abies*) and azaleas (*Rhododendron*). Flowers of all sorts bloom in a riot of colour in spring; and the mountains show many different seasonal faces: the luxuriant growth of vegetation in summer; the golden palate of colours in the fall; and the pristine snow-blanketed landscape of mid-winter.

Criterion (ix)

Because of the unique geological origin, Fanjingshan exhibits special evolution as an ecological green “island” on a metamorphic dome emerging from a vast ocean of karst landscape. The geological history and uplifting and eroding processes are well studied and documented and the mountain still rises today.

Having emerged as a contrasting habitat “island”, the patterns of species occurrence and distribution trace a complex history. One of colonization, extinction, local evolution of endemism is due to isolation and responses to changing climates over the long term. In South China, Fanjingshan is thought to be the first dry land to emerge from the sea, with the longest history of colonization by terrestrial species. Today, 75% of the flora in Fanjingshan truly behaves like an island.

Paleo-spore pollen records are contained in the alpine wetlands that trace changes in tree communities since the Holocene whilst tree ring cores from ancient trees preserved in the village fengshui (sacred forests) can give a detailed history of changing climate over the past thousand years.

In summary, Fanjingshan is a magnificent representative of subtropical mountain deciduous forest and an unusual example within the Oriental Deciduous Forest biogeographic province. It is a naturally functioning ecological island formed millions of years ago, a scenario which has given birth to a unique ecosystem of outstanding diversity. This relatively compact ecosystem has been in the process of species evolution since the beginning of Quaternary and continues to evolve today.

Criterion (x)

The unique geographical location and geomorphological features, favorable climatic conditions and little disturbance by human activities has made Fanjingshan extremely rich in biodiversity. It has been managed to preserve a large number of ancient relict, rare, endangered and endemic species. The area provides vital habitat for 230 species of rare and endangered plants and 115 species of rare and endangered animals, such as *Paulownia kawakamii* (CR), *Bretschneidera sinensis* (EN), *Andrias davidianus* (CR), *Moschus berezovskii* (EN) and so on. The nominated property also provides essential habitat for 46 species of endemic plants, 4 species of endemic vertebrates and 245 species of endemic invertebrates. There are 36 species of Gymnosperm and 791 species of Bryophyte in Fanjingshan. The nominated property has one of the richest concentrations of gymnosperm flora in the world. It is also the area of richest bryophytes in the Oriental Deciduous Forest biogeographic province.

Fanjingshan is the only natural habitat and therefore the most important in-situ conservation site for the globally endangered Guizhou snub-nosed monkey *Rhinopithecus brelichi* and the Fanjingshan fir (*Abies fanjingshanensis*). *Rhinopithecus brelichi* has a key position in understanding the evolution of primate species. Its population is less than other species (Golden monkeys) and its habitat area within the nominated property represents the smallest area in the world. *Abies fanjingshanensis* is one of the four *Abies* species located in the subtropical zone and is listed on the IUCN Red List as an endangered (EN) species. The nominated property preserves the only *Abies* dark coniferous forest type in the subtropical zone.

Fanjingshan retains a large area of more than 15,600 ha of original beech (*Fagus*) forest which is considered to be the most important site for protection of *Fagus* forest as it contains the world's biggest and most contiguous primeval beech forest in the subtropical region. Fanjingshan's beech forest possesses outstanding conservation importance and scientific interest value as it serves as a globally precious gene bank and provides insights into how its suitable environment through subtropics evolved into temperate zone.

c) Statement of integrity

The nominated property of Fanjingshan is composed of three contiguous areas - namely Fanjingshan National Nature Reserve, the north core area of Yinjiang Yangxi Provincial Nature Reserve, and a small area of National Non-Commercial Forest in the northeast, the boundaries of which are totally coincident without any gaps. Fanjingshan was also designated a UNESCO Man and the Biosphere Reserve in 1986. The property includes all of a metamorphicrockdome and is thus quite different from the surrounding karst

landscape of the Yunnan Guizhou Plateau. Fanjingshan is in fact a micro biogeographical unit in its entirety. The property is of adequate sizes to ensure the complete representation of the features and processes which convey the property's significance, such as the main aesthetic landscape elements and the habitat and current range of *Rhinopithecus brelichi*, the distribution area of *Abies fanjingshanensis* dark coniferous forest and the beech forest ecosystems mainly consisting of *Fagus longipetiolata*. Most of the nominated property remains primary forest, and a few residents live in the Tuanlong Village, Lingfeng Village and Dianchang Village relying on traditional farming. Fanjingshan is unusual in having been home to the different ethnic minorities who use forest resources in their own distinct cultural ways but all in a sustainable manner so that 90% of the forest coverage is still maintained.

The nominated property has been fully demarcated and the boundaries of the nominated property and corresponding buffer zone are all mapped and clearly marked on site. Boundaries follow topographical features, such as a mountain ridges, valleys and rivers, and thus support ecological function.

Challenges and threats to the integrity include human pressure from use of the nominated property by people living in and/or around it, and the pressures from tourism development. However many measures have been and are still being undertaken to address these issues. The natural environment and outstanding universal values within the nominated property are all well maintained. The buffer zone is designed to reduce human activities that may affect the value of the nominated property by regulating impactful developments such as tourism development, modern buildings, towns etc.

Belonging to a National and a Provincial Nature Reserve, the nominated property enjoys strict protections under national and local laws and regulations. To enable better coordinated management between the two nature reserves and to effectively protect Outstanding Universal Value of the nominated property, additional local regulations and *Management Plan* have been formulated by the local governments. Moreover, village rules established by local residents also play an important role in protecting the local ecosystem and environment.

d) Requirements for protection and management

All land in the nominated property is state owned and designated as protected areas such as National and/or Provincial Nature Reserve and National Non-Commercial Forest. Fanjingshan is also protected as part of the UNESCO Man and Biosphere Reserve Network. The protected areas which constitute the nominated property have been protected by relevant local and national laws and regulations for many decades and by cultural beliefs and practices for centuries. A multi-level management system, from the

national level to the local level, has been established to manage the nominated property. In addition, a co-operative system involving various sectors of the government, technical institutions, research institutions and local communities, has been set up. Both of these systems are assured of sufficient funds and staff. Each management department within the National and Provincial Nature Reserves has its own responsibilities and cooperates with each other to ensure that protection and management work is carried out in a good and synergic order. In addition, the unique and long Buddhism culture of Fanjingshan shapes the belief systems and environmental awareness of indigenous people, allowing them to reach the agreement of folk groups to protect Fanjingshan's natural values in daily life. Therefore, a more complete top-down protection management system for heritage protection has been built. Under the vigorous publicity initiated by thelocal administrative department, all local communities are aware of and support the inscription of Fanjingshan on the World Heritage List.

Currently, the challenges for the protection and management of the nominated property include the following: narrow distribution range, small population and slow growth of *Rhinopithecus brelichi*; the ecosystem impacts arising from unreasonable lifestyle practices of few community residents, such as excessive use of fuel wood, grazing, logging, etc.; and lastly the development of the tourism industry has brought some pressure to the protection of the natural resources and ecological environment and needs strict control.

In view of the threats above, the nominated property has formulated a long-term *Fanjingshan Management Plan (2016-2030)* which establishes the overall management framework to protect the Outstanding Universal Value of the property and puts forward counter-measures and action plans based on the different values and challenges. The *Management Plan* promotes a participatory approach engaging rural communities and fostering sustainable development of tourism and other activities.

4. State of Conservation and Factors Affecting the Property

4.a Present state of conservation

4.b Factors affecting the property

4 State of Conservation and factors affecting the Property

4.a Present state of conservation

4.a.1 Physical condition and conservation of the property

The nominated property of Fanjingshan is a representative dome-shaped mountain ecosystem with a distinct boundary at mid-subtropical latitude, which is among the most intact montane ecosystems, and harbors many rare and endangered endemic species and typical vegetation altitudinal zonality. Based on the elevation gradient and long-standing nature, the nominated property presents the ecology and biology ongoing process of mid-subtropical and the dome-shaped mountain of Oriental Deciduous Forest biogeographic province in time and space.

The nominated property lies in the floristic intersection zone with diverse vegetation types, complex plant geographical elements, obviously transitional flora, which make Fanjingshan possess a host of plant species and rare and endangered plant species. There are 4,394 species of wild plants, 230 species of rare and endangered wild plants, 46 species endemic to Fanjingshan and 1,010 species endemic to China. With its dense forests, the property becomes a good habitat for many wild animals. Moreover, the nominated property has an ancient fauna and rich animal diversity. There are 450 species of vertebrates including *Rhinopithecus brelichi*, 2,317 species of invertebrates, 115 species of rare and endangered vertebrates and 249 species of endemic animals. According to remote sense analysis from 2009 to 2015, the ecosystem in the property is becoming better, which ensures the stable development of the species. At the same time, the nominated property also contains the mountains, rocks, forests, water, weather and other elements of the natural landscape, as well as the landscape dynamic changes. All of these have shown the comprehensive beauty of the landscape of the property.

Photo 4.1 Natural beauty of the nominated property of Fanjingshan

The nominated property has been successively granted various protective designations, such as National Nature Reserve, Provincial Nature Reserve and National Non-Commercial Forest (see 5.b.1). Accordingly, Fanjingshan is protected by relevant laws and regulations. A four-level management system is in place, the top level being the state, then Guizhou Province, then Tongren City, and finally at site level: the nominated property. Accordingly, the Administration of National Nature Reserve has been established to undertake united management activities on behalf of the government. Thus, staff, material resources and funds are all guaranteed. *Fanjingshan Management Plan (2016-2030)* has been developed, boundaries have been defined, and a monitoring system has been established (Details see 6.a) to provide real time monitoring to rapidly respond to issues. In general, the Outstanding Universal Value of the nominated property is well protected, including the ecosystems, habitats of rare and endangered species, aesthetic landscapes, and the integrity of species trends, ecosystem and natural environment.

4.a.2 Threats to the outstanding universal value and its conservation measures

4.a.2.1 Aesthetic value

(1) Threats and challenges

In general, the nominated property is in an excellent state of conservation. Management has traditionally focused on the protection of ecological diversity, significant landscape features and the cultural landscape. Nevertheless, there are some past, current and potential threats and opportunities which will require strong protection measures to ensure the aesthetic values of Fanjingshan remain intact. Issues include:

The development of tourism, which is still in its infancy, brings some pressures to the aesthetic value presentation of the nominated property; especially during the peak use period of “Golden Week”, when some of the scenic spots have visitor overload problems.

Indigenous ethnic people has been influenced by other cultures; original houses have in some cases been expanded or rebuilt with the construction materials and decorative materials that may not harmonize well with the natural environment.

The Buddhism architecture has aesthetic value in the nominated property, which has combined the features of ancient buildings and local buildings. However, due to natural weathering and human damage, some temples are losing their original architectural beauty.

Littering from household refuse and visitor generated rubbish occurs frequently in some communities in the nominated property and the buffer zone, which can impact the environment of the property.

There are many landscape features which characterize the nominated property, but the iconic geoheritage which demonstrates the aesthetic outstanding universal value needs to be more clearly identified and further researched.

Some small areas of the nominated property in the northwest have a legacy of impact from past gold and copper mining activity.

(2) Conservation measures

The maximal carrying capacity for the nominated property are identified to the number ensure that tourist receipts comply with the environmental carrying capacity of the property; study the timing of tourist behavior, and patterns of spatial distribution are studied; the tour route organization are optimized to avoid the peak hour/season of visitor flows in the key scenic spots on different tour routes to avert excessive environmental stresses in some localities; release the information of tourist arrivals to the public and adopt means of tour reservation to guide the spatial movement behaviors of tourists; monitor the *status quo* of areas with potential tour congestion, and establish and improve early-warning systems to avoid sudden visitor overloads beyond the environmental carrying capacity.

Any original buildings with values for the environment should be maintained. The buildings with cultural relic's values must be strictly protected. Residential sites, villages and indigenous buildings (and their surroundings) with distinct features need to be strictly protected; the tourism facilities, residential housing construction in the nominated property should be planned in a unified manner; local materials should be used as much as possible to keep the specifications, body mass and overall style in harmony with the natural landscape; existing buildings which are incompatible with the environment in nominated property or the buffer zone should be renovated or removed; all kinds of buildings which have a negative impact on the landscape should be removed to restore the harmonious visual landscape.

A more detailed plan specifying landscape conservation and regulations concerning construction and management shall be formulated. A geographic information system of the nominated property and the buffer zone should be established. The approval systems for construction projects in the nominated property and the buffer zone should be improved and tightened. Construction management should be strengthened through

specialized protective law enforcement and inappropriate construction projects should be nipped in the bud. Multi-level, real-time monitoring should be undertaken.

Detailed study of the temple ruins in Fanjingshan should be carried out. On the premise of retaining its authenticity, the damaged temples should be repaired and reconstructed to restore their authentic traditional style and architectural beauty.

The environmental management and control in the nominated property and surrounding communities have been strengthening the residents' environmental awareness, and have been improving the natural beauty of the nominated property to be affected by environmental problems.

The research on geological history, geological evolution and geomorphogensis of the nominated property have been strengthening, the property has been protecting to reflect the geological characteristics.

All such illegal mining activities were terminated in 2006, mine shafts were filled and damaged vegetation was allowed to recolonize the sites.

4.a.2.2 Biological and ecological process value

(1) Threats and challenges

The nominated property is an outstanding representative of ecosystems in mid-subtropical humid mountain areas of Central Asia, with complicated forest formations and extensive endemic vegetation. It has received good supervision and protection, but the inevitable natural hazards and the increasing tourist activities lead to some threats and challenges including:

The occurrence of natural disasters, such as, geological disasters and meteorological disasters, etc. will potentially affect the habitats and communities in the nominated property.

Along with the development of tourism, the construction of tourism facilities including a cable car, and tourism access infrastructure inevitably have some impact on the ecosystem, bringing various types of solid, air and noise pollution and threatening ecological circulation and biological activities.

There is an abundant river ecosystem in this nominated property, and it flows through the residential area, so the waste water from residents may threaten part of the river ecosystem of the nominated property and its buffer zone.

Some residents around the nominated property are engaged in farming activities, and the extensive management of livestock which can be illegally grazed inside the property, will result in some potential influence on the habitat and pollution of streams.

The possible entrance of the alien species will put pressure on endemic species and their habitats.

Habitats and species are affected by climate change, but relevant study and monitoring are still inadequate to fully understand the impacts.

(2) Conservation measures

Strengthen the early warning systems for prevention and treatment of natural disasters in the nominated property, carry out real-time monitoring of natural disasters and take effective measures to mitigate impacts.

The behavior of visitors (including reducing noise levels) have been regulating, the quantity of tourists have been controlling, and unnecessary construction of tourism facilities have been reducing. When selecting the site of tourist facilities in the future, work to avoid communities of the rare species and their habitats. Strictly carry out ecological restoration on the basis of environmental impact assessment, to prevent irreversible damages to the resources and their habitats from construction. Natural recovery of damaged vegetation is the preferred option for restoration rather than replanting.

The environmental education on the residents living around the nominated property and the control of rivers has been strengthening; any threat to the river ecosystem from industry and domestic sewage and other garbage have been reducing.

It is forbid to feed wildlife in the nominated property; awareness on wildlife feeding impacts of the residents have been raising, appropriate ecological restoration of any disturbed vegetation has been implementing.

Establish an efficient monitoring system for alien species and launch the interrelated scientific research to decrease the occupation and damage from alien species in the nominated property.

Establish a state of the art climatic monitoring system and an early warning system, and take *in situ* conservation measures against species reduction caused by the climate change.

4.a.2.3 Biodiversity value

(1) Threats and challenges

At present, the biodiversity and habitats in the nominated property have been well protected. However, the nominated property has suffered threats from human activities and natural disasters of different types and different levels, so the protection of biodiversity is faced with some potential threats and challenges including:

Further infrastructure construction in the nominated property and the buffer zone, could directly destroy habitats of wildlife, reduce their ranges, limit their foraging, mating and hiding ranges and even increase species competition.

The population of *Rhinopithecus brelichi* is very small and slow in growth with restricted habitats. Human activities may have an impact on their living space, food resources, reproduction, and health. Researches about the habitat dynamics are too poor to provide a full basis for protection and management.

Extreme climate events, such as icy snow calamity, drought and flood, etc. may threaten the survival and reproduction of rare and endangered species.

Abies fanjingshanensis is narrow in distribution and poor in natural regeneration, so the natural disasters and human activities may have an impact on its species and habitats.

The construction of tourism infrastructures, hotels and farmhouses in the buffer zone, tourism activities and the bad behavior of some tourists, who drop litter, pick plants, and make a noise etc. in the nominated property, may threaten wild plants and animals and their habitats.

Research knowledge about the habitat dynamics is too poor to provide a full basis for protection and management.

(2) Conservation measures

Unnecessary human activities have been reducing within the living area of the rare and endangered animals in order not to disturb or destroy the normal lifecycles and activities of wild animals.

Ecological management and restoration should be conducted in infrastructure construction areas, such as setting up some culverts to ensure animals pass through the road, remove all fences and relieve the barrier effect of the infrastructure construction.

Plan and encourage natural restoration of wildlife corridor to allow wider migration, breeding and stable food of *Rhinopithecus brelichi* access. Improve monitoring of wild

population including use of remote thermal imagery from drone at night. Revise the studbook and planning an efficient breeding program (Table 4.1) (IUCN, 1999). Conduct feasibility studies to identify secondary release sites where a new population could be established (Figure 4.1) (IUCN, 1999).

Table 4.1 Guizhou Snub-nosed monkeys studbook (*Rhinopithecus brelichi*)

Stud#	Sex	Birth date	Sire	Dam	Location	Date	Local ID	Event
G001	F	-1985	WILD	WILD	FANJING	-1 Apr 1993	UNK	Capture
G004	M	-1985	WILD	WILD	FANJING	-1 May 1993	UNK	Capture
G005	M	-1985	WILD	WILD	FANJING	-1 Jun 1993	UNK	Capture
G010	F	-1980	WILD	WILD	FANJING	-1 Apr 1993	UNK	Capture
						-1 Jul 1997		Death
G011	F	-1985	WILD	WILD	FANJING	-1 Apr 1993	UNK	Capture
G012	M	-1993	WILD	G011	FANJING	-1 Apr 1993	UNK	Capture
G014	M	-1985	WILD	WILD	FANJING	-1 Sep 1993	UNK	Capture
G015	M	-1990	WILD	WILD	FANJING	-1 Oct 1993	UNK	Capture
						-1 Nov 1993		Death
G016	F	-1985	WILD	WILD	FANJING	-1 Oct 1993	UNK	Capture
G017	F	-1985	WILD	WILD	FANJING	-1 Apr 1994	UNK	Capture
G019	F	18 Apr 1995	G005	G001	FANJING	-18 Apr 1995	UNK	Birth
G020	F	11 Apr 1996	G014	G016	FANJING	-11 Apr 1994	UNK	Birth
G021	M	7 Apr 1996	G004	G016	FANJING	-7 Apr 1996	UNK	Birth
G022	M	7 Apr 1996	G004	G017	FANJING	-7 Apr 1997	UNK	Birth
G023	F	16 Apr 1999	G005	G001	FANJING	-16 Apr 1999	UNK	Birth
G9501	F	19 Mar 1995	G014	G016	FANJING	-19 Mar 1995	UNK	Birth
						-19 Mar 1995		Death
G9801	F	20 Apr 1998	G005	G001	FANJING	-20 Apr 1998	UNK	Birth
						-20 Apr 1995		Death

Totals: 7.10.0 (17)

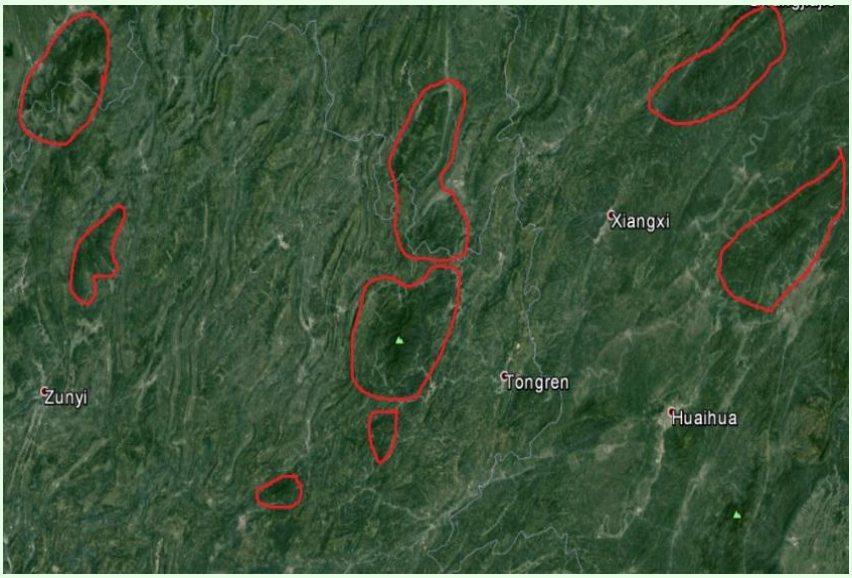


Figure 4.1 Possible sites for translocation

Impacts from and contact with local communities and tourists. Increased tourism numbers should proceed only very cautiously based on careful monitoring of impacts on the snub-nosed population (numbers, reproductive success, ranging patters, diet changes, general behavior, and health).

The exchanges and cooperation have been strengthening with relevant international and domestic units. Colleges and biological research institutions should be invited to establish a species diversity research base, develop comprehensive research of the *Rhinopithecus brelichi* and improve the investigation and monitoring of biodiversity in the nominated property.

Enhance exchanges at home and abroad, develop some research on how global warming impacts rare and endangered species like *Abies fanjingshanensis*, *Fagus longipetiolata*, etc. and explore appropriate climate change related conservation measures.

Studies on the survival and reproduction of *Abies fanjingshanensis* should be further carried out. Make a breakthrough in its breeding to expand the population and adopt some technical measures to promote the continuation and development of the population.

The management agency should formulate a more detailed tourism master plan for the nominated property, to renovate the tourism facilities which impact the biodiversity and habitats in the nominated property; strengthen publicity and education of tourists, review information signs and warning billboards and prohibit the damage to biodiversity and habitat.

In order to improve the residents' abilities of recognizing and protecting the rare animal and plant resources in the nominated property, knowledge training about biology and ecology have been carrying out every 2 years, and education about the laws have been strengthening to avoid the destruction of rare biological resources by residents' production and living activities. More residents should benefit from the ecotourism potential through development of household based visitor accommodation and cultural interests in the buffer zone.

The investigation and monitoring of biodiversity and wildlife have been improving; some fixed monitoring sample plots and routine monitoring patrols have been arranging using standard recording of sightings, use of transects, automatic camera grids etc. to monitor the animals and plants in the property.

4.a.3 Indicators and statistical benchmarks

Currently, the nominated property of Fanjingshan achieves some monitoring results, which can help protect the values. Based on the resource types, protective status and management requirements, the nominated property has established various monitoring facilities including monitoring centers, monitoring stations, checkpoints, meteorological stations, ecological fixed-point observation stations, observatories, protection and management points, hydrology and water quality monitoring points, etc. with monitoring equipment like GPS, camera, infrared camera, drones, automatic meteorological instrument. The monitoring system is still in development but includes indicators relevant to the Outstanding Universal Value, visitors' activities and impact, environmental elements, natural disaster, settlements and villages (see 6.a for detail). Cooperation with other research institutions shall be set up as a comprehensive monitoring platform.

4.b Factors affecting the property

Due to the effect of different forms of natural and human activities, the protection of ecological processes, biological diversity, aesthetic landscape value of the nominated property of Fanjingshan will face threats and challenges to some extent. However, the nominated property has already enjoys international, national and provincial protective designations (UNESCO Man and Biosphere Reserve, Guizhou Fanjingshan National Nature Reserve, Yinjiang Yangxi Provincial Nature Reserve, National Non-Commercial Forest); and its buffer zone also has some protective designations (Fanjingshan-Taipinghe Provincial Park, Yinjiang Muhuang Provincial Park), and a series of protective measures have been taken to reduce the adverse effects of various activities.

(i) Development Pressures

A Community Economic Investigation in 2016 shows that, the economic level in the surrounding villages of Fanjingshan is relatively low, the average economic income *per capita* of residents in the nominated property and the buffer zone is about 5,788 Yuan/year. The main economic sources for indigenous people are employment work, ecological tourism, forestry management, fishing, traditional planting and breeding, raising medicinal plants, transferability income and borrowing income (Figure 4.2). Among them, employment income is the predominant source of family cash income. The increase of employment worker and employment work income could ease the human-land conflict with potential to impact Fanjingshan. There is a weak social economic development level in the nominated property and the buffer zone with a relatively single industrial structure, and agriculture and forestry production which have a certain dependence on land and

forest resource. Therefore, the demand for natural resources by indigenous people cannot be ignored. The energy consumption of surrounding residents of the nominated property is mainly fuel wood, and they are used to cutting wood for fuel and construction timber. In addition to destroying forest habitat, woodcutting is a disturbance factor for wildlife, including the *Rhinopithecus brelichi* whose movements are significantly influenced by it. There are some livestock grazing by a few residents in the buffer zone, which, while the proportion is small, still degrades wildlife habitat.

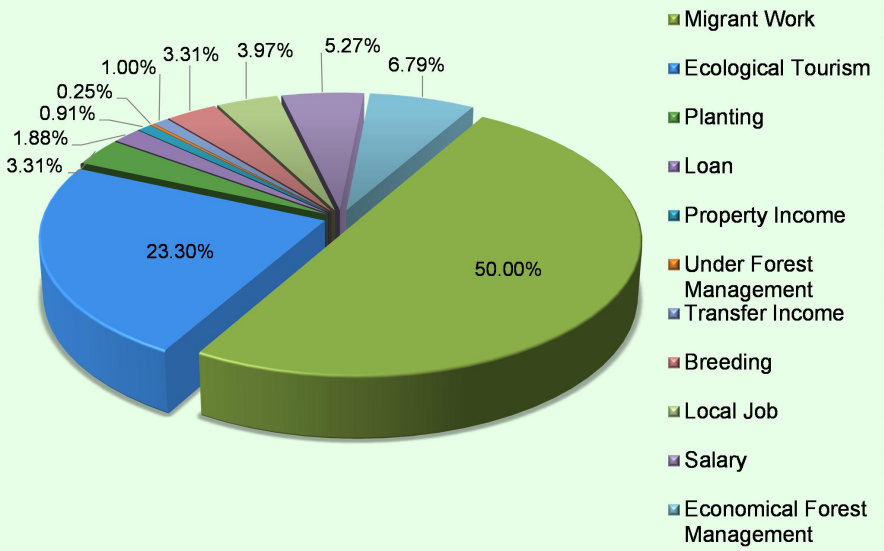


Figure 4.2 Income structure of the community residents

For the above situation, the economic income level of residents should be improved through efforts to promote alternative livelihoods and a transformation within the nominated property and its buffer zone. The government has been formulating ecological compensation subsidies and preferential policies to encourage the residents of the nominated property and the buffer zone to out-migrate and be employed to reduce the residents' dependence of the nature resources, thereby promoting a more sustainable development of the nominated property and the buffer zone. To reduce and eventually eliminate the use of firewood, the introduction of fuel-efficient charcoal stoves and clean energy would be a first step in the desired direction, and a degree of financial subsidy should initially be offered. Forbid feeding wildlife in the nominated property, popularize the feeding knowledge to residents, and implement appropriate ecological restoration of the destroyed vegetation. Although poaching is not perceived as a current threat in the nominated property, vigilance should be maintained against any reappearance. Penalties in the courts for those convicted of poaching offences should be periodically reviewed by reserve management in collaboration with justice officials so as to ensure they are maintained at levels which constitute an effective deterrent.

In addition to economic development pressure, the construction of new infrastructure and the reconstruction and expansion of infrastructure, such as tourism reception facilities, residential housing, and village roads, and so on will inevitably lead to further natural habitat fragmentation in the buffer zone. Especially, the regional accessibility has been improved with the building of country roads, which increased the population pressure of the nominated property. Consequently infrastructure construction in the nominated property and its buffer zone should be strictly controlled to guarantee there will be no adverse impact on Fanjingshan's values; construction projects that must be built should be approved by competent authorities of the people's governments at all levels based on the requirements of "unified planning, strict approval", and the relevant supervision and management should be undertaken by the Office of the Leading Group for World Heritage Nomination of Tongren City; any vegetation coverage in the areas damaged by the infrastructure construction should be restored by encouraging natural regeneration. So far, the development pressure on the natural ecological environment of the nominated property and its buffer zone has been greatly eased.

(ii) Environmental pressures

Water Environment: Water Environment: The nominated property is on the divide between the Wujiang and Yuanjiang river systems, many surface rivers, which originated in Fanjingshan, develop a fine and radiating drainage pattern. The surrounding environment is less threat to its water environment. The potential impact includes the sewage from travel activities and a small amount of residents' lifestyle practice in the nominated property. For the potential threats, the nominated property has been stressing the closing hillsides to facilitate natural reforestations and construction of ecological conservation forest. Meanwhile, scientific management practices are used to treat waste water caused by tourism and measures of decrement at sources, process control, and end treatment. A sewage disposal project has started and sewage collection pipe network has been built, surrounding Fanjingshan Nature Reserve in a triangular shape. There are 14 water resource management points in the nominated property and its buffer zone. The residents' behavior is becoming regularized and rubbish is banned from being discharged into the rivers through making village rules and adhering to the principle of apanage management. Through the measures above, water pollution is managed and controlled effectively. The water quality is good.

Air environment: The nominated property may be threatened by the potential threat from transport vehicle exhaust, traditional lifestyle energy sources etc. Various air quality management programs have been commenced. A rural biogas and the ongoing natural

gas home-entry project have started. Following the establishment of the nature reserve, air quality management has been enhanced. The air quality should be protected through increasing the residents' environmental awareness, popularizing biogas and establishing alternative energy demonstration villages.

Solid Waste: Solid waste from tourists, residential use and scientific research activities in the nominated property may pollute the rivers, atmospheric environment and soil etc. Fortunately, at present, collection-transfer-disposal system of solid waste has been built in the nominated property and its buffer zone. There are 247 dustbins, which are cleaned every day. All the waste is carried off-site by freight containers and the cable car, and then transported to the waste transfer station at the spot gate at Heiwanhe, and finally removed by the local departments of environmental sanitation. The rural environment protection volunteering activities have been launched. The situation of free discharging waste has been effectively controlled.

Noise: Because of dense vegetation around the highway and community in the nominated property and its buffer zone, the tour activities are divided into different areas, to limit noise pollution. Some sudden noise that perhaps disturb the animals' life is caused by tourists who loudly communicate and scream, some of the tour guides who use loudspeakers and car horns on the country road because of many curves and foggy weather, the signs of "No Horns and Slowing down" have been set up in *Rhinopithecus brelichi*'s activity areas and habitats of other rare wildlife; wide-angle lens have been installed at the curves in the nominated property. The sound environment of the nominated property and its buffer zone has been improved. Signs to warn tourists that excessive noise will be fined are planned.

(iii) Natural disasters and risk preparedness

(1) Extreme weather disasters

For the extreme weather disasters, such as summer rainstorms and winter frosts etc., the nominated property's meteorological departments do not only conduct daily monitoring, they do however send current and early warning messages about frosts and rainstorms to local government and relevant units.

(2) Landslide and mud-rock flow

For geological disasters, such as landslide and mud-rock flows, the administration departments have implemented the national natural forest protection project, afforestation, and closed forest project to protect the original forest system and ease the soil erosion.

Establish a geological disaster warning system to reinforce the monitoring and prevention of disasters in key areas. Make detailed and effective prevention measures, define the organizations that monitor and prevent geological disaster and the responsibility system. Besides, enhance the comprehensive command leading ability in case of urgent geological disaster, increase the emergency rescue and reaction speed and coordination level to minimize the loss of personnel, possessions and damage caused by geological disaster.

(3) Forest fire

Fanjingshan is an extremely wet and humid zone where forest fire is unlikely. In recent years, there has been no forest fire in large areas, so the nominated property is less threatened. And to prevent the forest fire, *Contingency Plan on Forest Fire in Guizhou Fanjingshan National Nature Reserve* and other systems have been formulated and issued. Both administrative leadership and staff post target responsibility systems are established. Three-level forest fire brigade and Fanjingshan compulsory brigade have been founded. Forest fire-prevention emergency passage, observation tower, fire-proof forest road and other facilities have been built. Fire-prevention tools and fire-fighting equipment has been purchased. The fire hazard investigation and remediation and fire drill on comprehensive emergency rescue exercises were held. The joint defense organization was founded with surrounding communities to reduce the fire incidence in Fanjingshan effectively.

(4) Forest diseases and insect pests

For the threat from the forest diseases and insect pests, a leading group was established to coordinate the prevention of forest diseases and insect pests and training was held to raise awareness among local people of harmful forest diseases and insect pests. Meanwhile, some professionals were engaged to provide information and mobilize residents in joint prevention activities. In addition fixed and flow monitoring points were set up in each quarter to monitor the forest diseases and insect pests for key forest areas, reducing the threats to forest. So far, the forest diseases and insect pests have not caused a big threat to the nominated property.

It is well noted that many insects that feed on leaves or even wood are totally natural and serve important regulatory functions in the forest ecosystem dynamics. Only in severe cases of alien species or diseases should human interference in these natural processes be attempted. In no case should non-targeted toxins be introduced into the natural ecosystem.

(iv) Responsible visitation at World Heritage sites

(1) Tourism development status

The current tourist activities are mainly distributed along the route of Heiwanhekou - Huixiangping - Jinding peak - Huguo temple - Zhangjiaba, as well as the visitor center and specimen museum. The patterns of use are mainly climbing along the forest boardwalk and tourist trails or via the cable car to visit the vegetation, sea of clouds and other natural landscapes.

There are no professional interpreters in the nominated property, and the audio interpretation machines installed on cable cars play a role of interpretation for a long time. Moreover, the inspectors and other staff are also act as temporary interpreters. The interpretation mainly covers natural beautiful scenery, biodiversity, wildlife protection, protection and management status and so on.

The current presentation and education facilities include visitor center and specimen museum. In addition, there are 1,454 information signs on both sides of the forest boardwalk and tourist trails at mountaintop and country roads in the nominated property, which play an important role in the publicizing the protection of the nominated property's natural values.

Aimed at reducing potential tourist pressure, tourists have been restricted to enter only some scenic spots of the nominated property and the visitors entering the nominated property per day is strictly limited to 8,000 persons. The tourist quantity and impacts are closely monitored and if it draws close to saturation that day, no more scenic spot tickets will be sold. Moreover, measures have been taken at individual scenic spots such as opening in different time periods with all the human activities carried out during the daytime to reduce the influence of human activities on the habitat environments of the plants and animals. Signage is being displayed to reduce noise by tourists. A series of ecotourism plans have been formulated and implemented, and related national laws provide the legal basis for protection and management. Through the measures above, the eco-environmental pressures have been relieved.

(2) Tourist quantity forecast

A small amount of general tourism, as well as some adventure tourism, scientific investigation, and patrol activities exists in the nominated property. The number of visitors is increasing year by year with the tourism development of the nominated property, which increased from about 180,000 person-times in 2010 to more than 360,000 person-times in 2014. And the seasonal distribution of visitors is uneven: more visitors come to the

nominated property during April to October, while fewer visitors come during November to next March. Carrying capacity of the nominated property is based on the ranging behavior and reproductive success of *Rhinopithecus brelichi.* The majority of the nominated property is the core area of Nature Reserve, where is strictly forbidden to enter according to the *National Nature Reserve Management Regulations*. Based on the *Management Plan*, the presentation zone accounts for only 2.11% of the total area of the nominated property, only a small part of which overlaps with *Rhinopithecus brelichi* range and potential range (Figure 4.3). The administration is planning for gradual growth of tourism numbers but will monitor their impacts very closely. When tourist numbers start to damage the OUV, it is time to stop growth and reduce to sustainable levels.

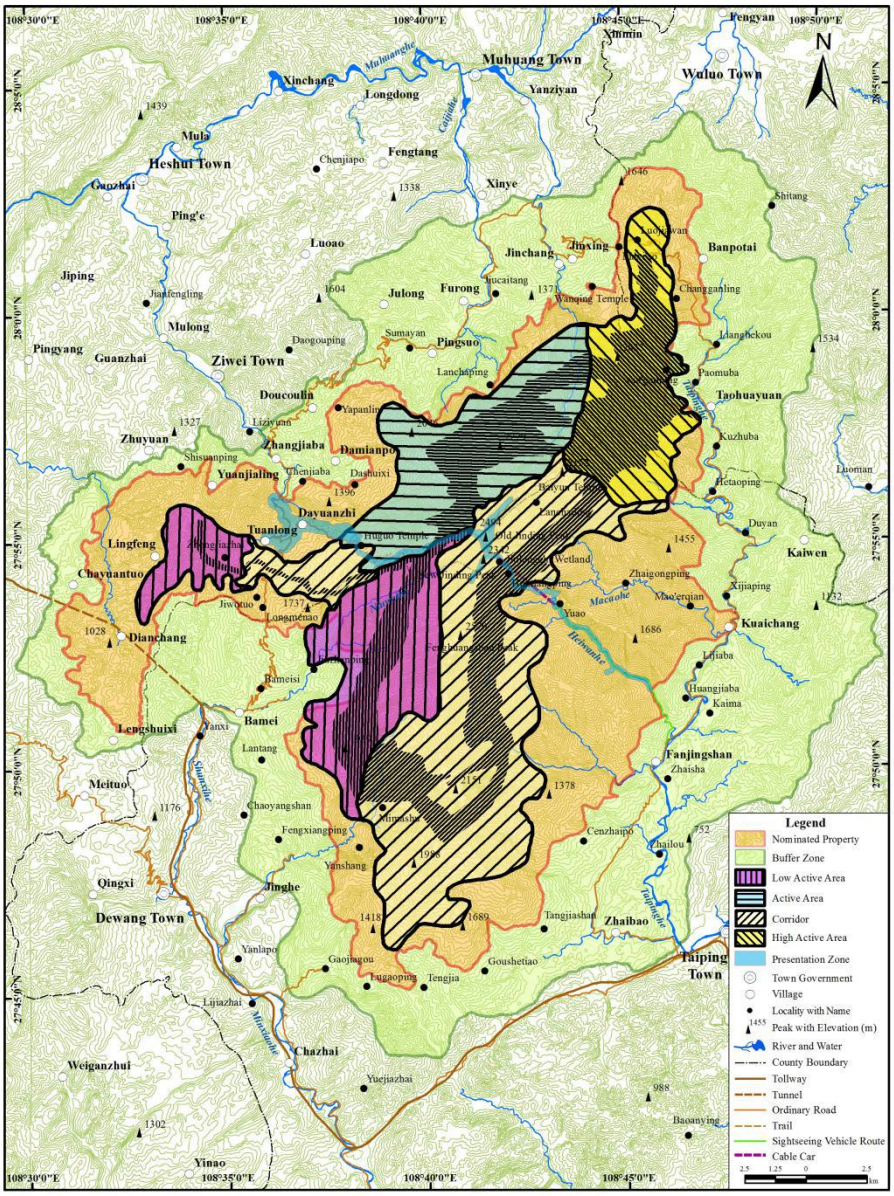


Figure 4.3 Relationship between presentation zone and *Rhinopithecus brelichi* active area

(3) Tourist quantity control and management measures

- **Tourism quantity control**

Site managers need to be very cautious in allowing tourist numbers to become a threat. Increases should be gradual in line with close monitoring of impacts on the wildlife and vegetation and especially the shy Guihzou Snub-nosed monkeys (numbers, reproductive success, ranging patters, diet changes, general behavior, health).

Study the spatial behavior of tourists to better understand the changes of time and space of visitor number in the nominated property and its buffer zone to make a more accurate pre-arranged plan for the management of tourists according to different seasons and spaces. Scenic areas of the nominated property have designed new tourism projects and travel routes outside the nominated property are designed to alleviate local overload and reduce the impact of tourist activities on the nominated property.

Impacts from growing tourism numbers can be reduced if tourists are directed spatially to areas not used by Guizhou Snub-nosed moneys in the buffer zone and very restricted display zones of the nomination area. Tourists are educated to remain quiet and not leave designated walkways or footpaths. Vehicles reduce speed and noise. Domestic animals are prohibited from nomination area.

Monkeys first. Wild troops of Guizhou Snub-nosed monkeys should be regularly monitored. In the event of a group seemingly wanting to migrate beneath the cable car, the operation of the car should be closed until the monkey group has successfully passed underneath or retreat back away from the cable car sector.

Safe tourism capacity should be carefully monitored and may vary at different times of the year. It is a good idea to give more information about the nominated property to visitors by networks, newspapers, phone apps or other ways to guide the spatial choices and behavior of visitors. Plan the tourist routes scientifically and systematically to coordinate tourism numbers within the safe capacity of different tourist routes. According to the monitoring and evaluation of tourism number, limit the number of visitors and visiting time to avoid overloading.

Changing the price of tourism in different seasons can both encourage some visitors to come in off season periods and also allow numbers to be reduced without loss of total earnings at busy seasons.

- **Management of tourist security**

The site includes steep climbs, moderate altitude, slippery conditions in rain or ice, exposure to severe weather, lightening, loose rock surfaces etc. There are risks to visitors of falls or health concerns. To ensure the tourist security and prevent accidents, the nominated property has to establish and improve its rescue system, security monitoring, regularly check safety of steps, walkways and platforms, intensify security administration with the increase of security check points. In addition, to ensure the personal and property safety of tourists, it is necessary to establish a Safety Supervision Brigade in charge the personal and property safety of tourists.

Through compiling and issuing a security manual, bulletin boards, signage and other ways, publicize and educate safety knowledge to visitors to avoid the safety problems caused by lack of safety awareness. The safety education in the nominated property is mainly given through notice boards with various safety signs set up beside steep slopes, areas where *Rhinopithecus brelichi* often appears, trees on the road, important fire protection places and other important places.

Segregate dangerous areas with guardrails to avoid possible dangers and improve safety facilities on the tourism route in the nominated property.

Publicize the assistance phone number for emergencies in conspicuous places in the nominated property. Geographical markers should be regularly placed so any visitor in trouble can relay exact location accurately and facilitate speedy rescue.

- **Management of tour environment**

Buildings affecting the environment and the integrity of the landscape have been demolished or renovated, and a series of ecological restoration projects have been implemented. The tourism development mode and its infrastructure construction have been rationally planned and arranged to avoid threats to Outstanding Universal Value of the property.

Make regulations for the tourist facilities construction in the nominated property, propose clear requirements for buildings volume, shape, color, texture, harmony with the surrounding environment and other aspects, and issue the regulations to enterprise and nearby residents simultaneously.

Monitor the number of tourists and the environmental impact of the tourism, and adjust the protection management measures according to the results of monitoring, limit the scale of

tourism activities, avoid interference to the ecological system and disturbance of animals or animal nests.

Arrange the dustbins along tour routes, ensuring a full coverage of garbage collection device in the nominated property. The exterior decoration of the garbage cans should be harmonized with the surrounding environment. The number of dustbins and refuse transfer vehicles should be increased and workers should be employed to clean up the waste in the periods when tourist number increases or the area where tourists gather, to ensure the quality of the environmental health in the nominated property and visitor appreciation.

Dispose of toilet wastes, clean up and transport the non-biodegradable waste to the waste transfer station in good time. Build new tourism eco-toilets, and gradually replace the original old toilets, reduce the pollution of toilet waste in the nominated property.

- **Potential degradation from tourist pressure**

Large numbers of visitors can overwhelm reception facilities, and increase waste water, solid waste, visual pollution and soil compaction to threaten the natural ecological environment.

Motor vehicle emissions, catering services exhaust and combustion of firewood, can cause some air pollution. Speeding cars are a threat and disturbance to shy wildlife.

Pollution caused by the noise and car horns made by the tourists may disturb animals, disturb or impact animal behavior and habits, or otherwise threaten the balance and naturalness of the ecological environment.

Due to sudden and local saturation of tourists, the natural environment of the nominated property is facing greater pressure, which could damage the habitats and living environment of the wildlife in the nominated property.

Photo 4.2 Lofty and precipitous peaks

(v) Number of inhabitants within the property and the buffer zone

The nominated property and the buffer zone cover a total area of 77,514 hectares, with 5,692 households and 21,905 residents (Table 4.2).

Table 4.2 Population distribution (2016)

Zone	Area（ha）	Villages	Households	Population	population density (person / km^2)	
The nominated property	40,275	5	718	2,637	7	
The buffer zone	37,239	18	4,974	19,268	51	
Total	77,514	22	5,692	21,905	Average population density	28

Notes: The village of Kuaichang spans across the nominated property and the buffer zone

The nominated property covers a total area of 40,275 hectares, and there are 5 villages, including Tuanlong, Dayuanzhi, Dianchang, Lingfeng, Kuaichang, which are mainly in the west of the nominated property, with 718 households and 2,637 residents in all, and the population density is 7 persons /km^2. The major economic sources of the residents here are migrant work, traditional planting and breeding, and the living standard of people remains a state of self-sufficiency. With the development of urbanization, some residents have autonomously moved out of the nominated property in pursuit of convenient infrastructure and development opportunities. To better protect and manage the nominated property, some residents choose voluntary and compensated migration and relocation under the guidance of government. The administration of the nomination property has organized research panel to survey the livelihood of relocated residents. Detailed relocation plan and aid policy have been developed to protect the living standard of villagers after relocation. A few of residents come back to carry out ecotourism service activities in the buffer zone after the nomination work. In a whole, the population of residents in the nominated property appears a decreased trend.

The buffer zone covers a total area of 37,239 hectares, and there are 18 villages, including Kuaichang, Kaiwen, Fanjingshan, Zhaibao, Bamei, Doucoulin, Damianpo, Yuanjialin, Zhangjiaba, Furong, Pingsuo, Jinchang, Jinxing, Julong, Lengshuixi, Chayuan, Taohuayuan, Banpotai, with a total of 4,974 households and 19,268 residents in all, and the population density is 51 persons/km^2. The residents are mainly distributed in Taiping Town in the southeast, Wuluo and Muhuang Town in the northeast, and Dewang Town in the southwest. The buffer zone is the active area for tourism service activities. Some residents rely on developing eco-tourism services to get higher economic income.

5. Protection and Management of the Property

5.a Ownership
5.b Protective designation
5.c Means of implementing protective measures
5.d Existing plans related to municipality and region in which the proposed property is located
5.e Property management plan or other management system
5.f Sources and levels of finance
5.g Sources of expertise and training in conservation and management techniques
5.h Visitor facilities and infrastructure
5.i Policies and programes related to the presentation and promotion of the property
5.j Staffing levels and expertise (professional, technical, maintenance)

5. Protection and Management of the Property

5.a Ownership

The nominated property of Fanjingshan is owned by the People's Republic of China according to the *Constitution of the People's Republic of China* in which article 9 stipulates that the mineral resources, waters, forests, mountains, grassland, un-reclaimed land, beaches and other natural resources are owned by the State, that is, by all the people. The People's Republic of China guarantees the rational utilization of natural resources and protects plants and animals.

5.b Protective designation

5.b.1 Contents of protective designation

All land in the nominated property is state owned and designated as protected areas such as UNESCO Man and the Biosphere Reserve, National and Provincial Nature Reserve and National Non-Commercial Forest (Table 5.1). The northeast of nominated property is not part of the nature reserve, but it was designated as National Non-Commercial Forest and protected by the *Forestry Law of the People's Republic of China, Regulation on the Implementation of the Forestry Law of the People's Republic of China* and *Measures for the management of National Non-Commercial Forest*. Currently, the National Non-Commercial Forest in northeast part of the nominated property adding into Fanjingshan National Nature Reserve is on agenda.

Table 5.1 Protective designations of the components

Nominated property	Protective designations and approved date
Fanjingshan	Member of the UNESCO Man and Biosphere Reserve Network (1986)
	Guizhou Fanjingshan National Nature Reserve (1986)
	National Non-Commercial Forest (1991)
	Guizhou Yinjiang Yangxi Provincial Nature Reserve (2016)

5.b.2 Summary of legal provisions and relevant articles that ensure the legal status of the nominated property

The legal status of the component parts of the nominated property of Fanjingshan derives from a number of relevant laws, regulations and provisions (Table 5.2).

Table 5.2 Relevant laws and regulations related to the protection

Laws, regulations and provisions	Issued date	Issued by
Constitution of the People's Republic of China (Revision)	March 2004	National People's Congress
Criminal Law of the People's Republic of China (Revision 8)	February 2011	The Standing Committee of the People's Congress
Law of the People's Republic of China on Environmental Protection	April 2014	The Standing Committee of the People's Congress
Law of the People's Republic of China on Wildlife Protection	August 2009	The Standing Committee of the People's Congress
Forestry Law of the People's Republic of China	April 1998	The Standing Committee of the People's Congress
Water Law of the People's Republic of China	August 2002	The Standing Committee of the People's Congress
Regulations of the People's Republic of China on Nature Reserves	October 1994	The State Council
Regulations of the People's Republic of China on the Wild Plants Protection	September 1996	The State Council
Regulations of the People's Republic of China on the Implementation of Terrestrial Wildlife Protection	February 2016	State Forestry Administration
Regulations Concerning Forestry of Guizhou Province	March 2000	The Standing Committee of the People's Congress of Guizhou Province
Regulations Concerning Environmental Protection of Guizhou Province	March 2009	The Standing Committee of the People's Congress of Guizhou Province
Measures for the Management of Natural Reserve Areas of Forest and Wildlife	June 1985	State Forestry Administration
Measures for the management of National Non-Commercial Forest	April 2013	State Forestry Administration and Ministry of Finance

Constitution of the People's Republic of China (Revision)

Article 22 The State protects scenic spots and historical sites, valuable cultural monuments and relics and other important items of historical and cultural heritage in China.

Article 26 The State protects and improves the living environment and the ecological environment, and prevents and controls pollution and other public hazards. The State organizes and encourages afforestation and the protection of forests.

Criminal Law of the People's Republic of China (Revision 8)

Article 340 A person who, in violation of laws or regulations on the protection of aquatic resources, fishes for aquatic products in an area where fishing is prohibited, during a period when fishing is prohibited or by using implements or methods that are prohibited, shall be sentenced to a fixed-term imprisonment of no more than three years, criminal detention, public surveillance or a fine if the circumstance is serious.

Article 341 Whoever illegally catches or kills rare or endangered species of wildlife under special State protection or illegally purchases, transports or sells rare or endangered species of wildlife under special State protection and their products shall be sentenced to a fixed-term imprisonment of no more than five years or criminal detention and concurrently a fine; if the circumstances are serious, the offender shall be sentenced to a fixed-term imprisonment of no less than five years but no more than ten years and concurrently a fine; if the circumstances are especially serious, the offender shall be sentenced to a fixed-term imprisonment of no less than ten years and concurrently a fine or confiscation of property.

Whoever, in violation of game laws or regulations, hunts in a game reserve, during a period when hunting is prohibited or by using implements or methods that are prohibited, thereby damaging wildlife resources, shall, if the circumstances are serious, be sentenced to a fixed-term imprisonment of no more than three years, criminal detention, public surveillance or a fine.

Article 344 Whoever, in violation of the provisions of the Forestry Law, illegally cuts down or destroys rare and precious trees or other plants under special State protection and their products, or conducts illegal acquisition, transportation, processing, sales of precious trees or other plants under special State protection and their products shall be sentenced to a fixed-term imprisonment of no more than three years, criminal detention or public surveillance, and concurrently a fine; if the circumstances are serious, the offender shall be sentenced to a fixed-term imprisonment of no less than three years but no more than seven years, and concurrently a fine.

Law of the People's Republic of China on Environmental Protection

Article 18 The people's governments or above the provincial level shall organize relevant departments or entrust professional institutions to investigate and evaluate the

environmental situation, and establish environmental resources carrying capacity monitoring and early warning mechanism.

Article 29 Ecological protection red line of key ecological function area, ecological sensitive area and vulnerable area and other areas are delimited by State with strict protection.

The people‘s governments at various levels shall take measures to protect regions representing various types of natural ecological systems, regions with a natural distribution of rare and endangered wild animals and plants, regions where major sources of water are conserved, geological structures of major scientific and cultural value, famous regions where karst caves and fossil deposits are distributed, traces of glaciers, volcanoes and hot springs, traces of human history, and ancient and precious trees. Damage to the above shall be strictly forbidden.

Law of the People's Republic of China on Wildlife Protection

Article 10 The State shall give special protection to the rare or endangered species of wildlife. The wildlife under special State protection shall consist of two classes: wildlife under first class protection and wildlife under second class protection. Lists of wildlife under special State protection shall be drawn up by the department of wildlife administration under the State Council, and adjusted every five years according to the assessment. Lists will be announced after being submitted to and approved by the State Council.

Forestry Law of the People's Republic of China

Article 24 The competent department of forestry under the State Council and the people’s governments of provinces, autonomous regions and municipalities directly under the Central Government shall delimit nature reserves and step up protection and administration in typical forest ecological regions, forest regions where rare and precious animals and plants grow and breed (multiply), natural tropical rain forest regions and other natural forest regions with special value of protection in different natural belts.

Article 25 Hunting and catching of wild animals under State protection in forest regions shall be prohibited; where hunting and catching are necessitated for special requirements, they shall be handled pursuant to relevant State provisions.

Water Law of the People’s Republic of China

Article9 The State shall protect water resources and adopt effective measures to preserve natural flora, plant trees and grow grass, conserve water sources, control water and soil losses and improve the ecological environment.

Regulations of the People's Republic of China on Nature Reserves

Article 18 Nature reserves may be divided into three parts: core zone, buffer zone, and experimental zone. In the nature reserve, the area whose ecosystems are well-preserved and in natural state, which is the centralized distributing areas of the rare or endangered animals and plants, shall be designated as the core zone, and all units and individuals shall be prohibited from entering. Unless approved in conformity with article 17 of this regulation, the core zone shall also be off-limits to scientific research activities. A certain area surrounding the core zone shall be designated as buffer zone, in which only scientific observations and research activities are allowed. The area surrounding the buffer zone shall be designated as experimental zone, which may be used for such activities as scientific experimentation, education, tourism and the domestication and breeding of rare and endangered wild animal or plant species. If considered necessary by the people's government who originally approved the establishment of the nature reserve, an outer protection area surrounding the nature reserve may be designated.

Article 26 It is forbidden to engage in such activities as logging, grazing, hunting, fishing, picking, reclamation, dredging, burning, and mining, quarrying, and so on in nature reserves, unless otherwise provided by the laws, administrative rules and regulations.

Article 27 It is forbidden to enter the core zone of a nature reserve. If entering the nature reserve is necessary for scientific research, an application and action plan must be submitted to the administrative agency of the nature reserve, and approved by the relevant administrative department of the nature reserve' under the people's government at or above provincial level before the applicants enter it to engage in scientific observations and research activities. In particular, in order to enter the core zone of a national nature reserve, approval must be obtained from the competent administrative department of the nature reserves under the State Council.

Regulations of the People's Republic of China on Wild Plants Protection

Article 9 The State shall protect wild-plants and their growth environment, and shall forbid any department and individual from illegally collecting the wild plants or destroying their growth environment.

Article 10 Wild plants are divided into the national key protected wild plants and local key protected wild plants. National key protected wild plants can be divided into the first class protected wild plants and the second class protected wild plants. The list of national key protected wild plants shall be determined by the forestry administrative department under the State Council, the agriculture administrative departments (the State Council administrative department of wild plants), the environmental protection, construction and other relevant departments, and the approval shall be announced by the State Council. Local key protected wild plants are wild plants beyond the national key protected wild plants, and protected by the province, autonomous region, municipality directly under the central government. The list of local key protected wild plants shall be formulated and announced by the province, autonomous region, and municipality directly under the Central People's government, reported to the State Council for the record.

Regulations of the People's Republic of China on the Implementation of Terrestrial Wildlife Protection

Article 8 The State shall protect wildlife and the environment for its survival, and shall prohibit the illegal hunting, catching or destruction of wildlife by any unit or individual.

Regulations Concerning Forestry of Guizhou Province

Article 11 The work of forest fire prevention adopts administrative leadership responsibility system at all levels of the people's governments. People's governments at various levels shall organize the relevant departments to establish and improve forest fire prevention organization, prepare the fire plans, set up and improve fire prevention facilities, develop forest fire prevention measures, organize mass prevention and fighting of forest fires. The fire-using system with certificate shall be adopted for field production in forest; and no fire for unproductive use shall be allowed.

Article 12 Forest pest and disease control shall be executed on the principle of “prevention first, comprehensive management”. The people's governments at various levels shall strengthen the leadership over the work of forest pest management, take necessary emergency elimination and treatment measures, coordinate to solve major problems when the explosive or dangerous outbreaks of forest diseases and insect pests occur.

Article 14 The people's government at or above the county level shall formulate natural forest protection planning, delimit natural forest reserves. The boundaries of protected area shall be indicated publicly. Logging natural forests is strictly prohibited.

Article 15 The people's governments at all levels should have a plan to develop fuel wood forest, improve burning and stove material technology, and progressively introduce coal, electricity, gas generation materials. For housing construction in rural areas, wood frame construction shall be gradually reduced.

Regulations Concerning Environmental Protection of Guizhou Province

Article 23 The governments of provinces, cities, autonomous prefectures and the administrative offices of the districts shall establish ecological function protection area in the river source region, important water source conservation region, soil and water conservation key protection region and key supervision area, and areas rich in biodiversity and important ecological function area. In accordance with State regulations, protective measures shall be taken to prevent ecological environment destruction and ecological function degradation. Development and construction activities which do not conform to environmental protection requirements within the ecological function protection area shall be prohibited.

Article 24 Development activities which do not conform to the environmental protection requirements within the scope of nature reserve, scenic spot, forest park, geological park, the world cultural and natural heritage areas shall be prohibited.

Article 33 Construction of livestock and poultry farm or aquaculture farms shall be prohibited in the following areas: (1) Scenic area, the Forest Park, city parks, world natural and cultural heritage, core zones and buffer zones of natural reserves, heritage conservation protection units; (2) Densely inhabited regions such as residential areas, cultural and educational scientific research area, and the medical districts in cities and towns; (3) Areas where culturing is prohibited the people's governments above the county level designate according to law. (4) Other regions needing special protection according to laws and regulations; where there are provisions in laws and regulations, those provisions shall prevail.

Measures for the Management of Natural Reserve Areas of Forest and Wildlife

Article 7 The establishment of nature reserves should pay attention to the integrity and the most suitable range of the object to be protected, considering the needs of the local economic construction and people's production and life, avoiding the people’s lands and mountains as much as possible; for those that cannot be avoided, the scope shall be strictly controlled. According to relevant regulations of the State, the problem of production and life shall be solved reasonably.

Article 11 Natural environment and resources of nature reserves should be managed by the management agencies of the nature reserves in a unified manner. No unit or individual is allowed to establish institutions and build facilities in the nature reserve without the approval of the Ministry of Forestry or the competent forestry department of provinces, autonomous regions and municipalities.

Article 14 Residents in a nature reserve shall comply with the relevant provisions of the nature reserve, fix the range of production and living activities, and engage in farming, aquaculture, and also may contract with labor or protection and management task organized by the nature reserve so as to increase the economic income without destroying the natural resources.

Article 15 The management organization of nature reserve shall form Protection Committee of nature reserve with the local and adjacent counties, township people's governments and other relevant units formulate the convention and jointly complete the protection management.

Measures for the management of National Non-Commercial Forest

Article 5 The State Forestry Administration shall be responsible for the guidance, coordination and supervision of the National Non-Commercial Forest at the national level, and the local forestry authorities at all levels shall be responsible for the protection, construction and management of National Non-Commercial Forest within their respective jurisdictions.

Article 7 The central government shall arrange the compensation fund for forest ecological benefits for the protection and management of National Non-Commercial Forest.

Article 11 The reclamation, quarrying, sand and/or soil extraction are forbidden in National Non-Commercial Forest, and strictly control the exploration, mining, expropriation or occupation of National Non-Commercial Forest for construction.

5.c Means of implementing protective measures

5.c.1 Management System

At present, the Administrations of Guizhou Fanjingshan National Nature Reserve and Yingjiang Yangxi Provincial Nature Reserve, as well as State Forestry Administration and Guizhou Provincial Forestry Department implement the effective management of the nominated property. After the declaration of world heritage, the nominated property of

Fanjingshan will establish a multi-level management system from the national level to the local level and a coordination mechanism including government agencies, technical institutes, research institutes and community, etc. (Figure 5.1).

The nominated property is directly administered by the Ministry of Housing and Urban-Rural Development of the People's Republic of China. The National Commission of the People's Republic of China for UNESCO is responsible for coordinating and assisting all departments of central and local governments to participate in the activities in various fields concerning this nomination organized by UNESCO.

A leading Group for World Heritage Inscription of Guizhou Province has been established by the People's Government of Guizhou Province, with the Office located in the Department of Housing and Urban-Rural Development of Guizhou Province. Its main responsibility is as a direct counterpart with the world heritage management structure of the Ministry of Housing and Urban-Rural Development. And according to the social and economic development status and heritage management needs, carries out regular exchanges and cooperation with international and domestic heritage management organizations and other related departments, coordinates the relationship in heritage conservation and organizes the preparation of the protection and development plans of heritage sites, demonstrates and authorizes the management and construction projects, and organizes experts to launch continuous monitoring and periodic assessment on the heritage management.

The People's Government of Tongren City has established the Leading Group for Fanjingshan World Natural Heritage Nomination of Tongren City, with an appropriate office. And the Government of Jiangkou County, Yinjiang Tujia and Miao Autonomous County and Songtao Miao Autonomous County have set up work organizations for the nomination respectively. The administrations of the Guizhou Fanjingshan National Nature Reserve and the Yinjiang Yangxi Provincial Nature Reserve are responsible for management of the nominated property respectively. To make Fanjingshan successfully inscribed onto the World Heritage List, it is necessary to integrate the two nature reserves together with the National Non-Commercial Forest in the northeast part of the nominated property to establish a unified management agency, and strengthen the co-management mechanism, enhance the harmonization and unification, improve the management ability, and resolve the conflict between development and protection.

Additionally an Expert Team was also established to be responsible for scientific and technical support and co-management. In addition, local departments and monitoring

institutions, scientific research institutions and institutions of higher education have done their duty to strengthen monitoring and scientific protection and management of the property. Also, traditional protection and local self-restraint protection of the indigenous residents plays an important role in protection and management. Thus, a multi-level and multi-function organization has been developed to ensure an effective and coordinated management system.

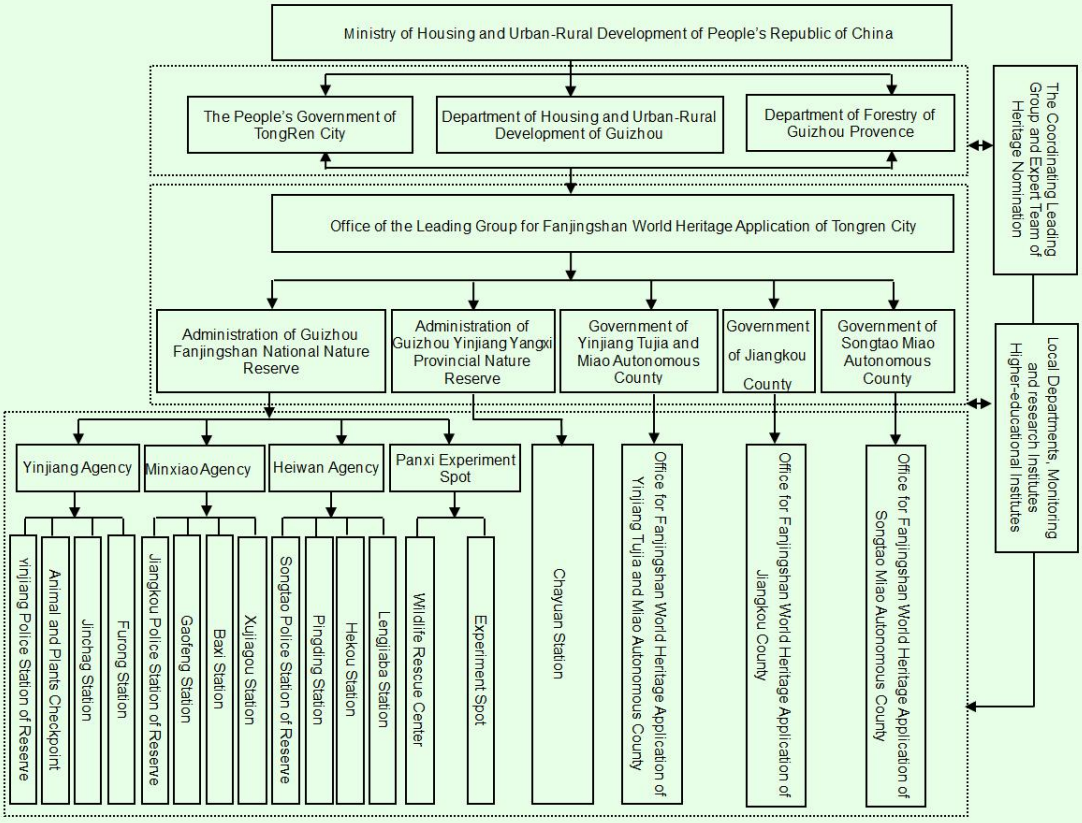


Figure.5.1 Management framework

5.c.2 Management agencies

The nominated property is managed by the following agencies (Table 5.3).

Table 5.3 Major management agencies and responsibilities

NO.	Name	Responsibilities	Address
1	Ministry of Housing and Urban-Rural Development of the People's Republic of China	Master plan, protection, construction, administering, harmony and guidance of the national parks all over the country. World natural heritage nomination affairs of China and mixed heritage nominations.	No.9, Sanlihe Road, Beijing, the People's Republic of China
2	Department of Housing and	Preparing the management regulations of protection, planning, construction, management,	NO.2 Western Yan'an

	Urban-Rural Development of Guizhou Province	monitoring and execution of the garden and greening; guidance of the operation work of administrative organizations in the National Park; organization and guidance on the management plan and particular plan; nomination and approval of National Park; guidance on the protection of biodiversity in the National Park.	Road, Guiyang City, Guizhou Province, China
3	Office of World Heritage Application and Management of Guizhou Province	Nomination and management of the world heritage, maintenance of the heritage resources. Entrusted by the competent department, it is responsible for investigation, evaluation, nomination, protection, inspection and management of the world heritage resource all over the province; plan, organization, examination and approval of the heritage sites; as well as training for the personnel undertaking the heritage work.	No.2 Western Yan'an Road, Guiyang City, Guizhou Province, China
4	Department of Housing and Urban-Rural Development of Tongren City	Responsible for the application and management of the world heritage in the city, protection, development and utilization; responsible for the co-ordination, plan formulation, data collection, inscription text editing, plan implementation and other daily works during Fanjingshan Application.	No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China
5	Administration of Guizhou Fanjingshan National Nature Reserve	Protection, management of and research on the forest resources and other natural resources in the area of Fanjingshan Reserve.	No. 17 West Sanxing Road, Shuangjiang Town, Jiangkou County, Tongren City, Guizhou Province, China
6	Administration of Guizhou Yinjiang Yangxi Provincial Nature Reserve	Protection and management the forest ecological and other resource within the scope of the Nature Reserve.	No.313 Fanjingshan Road, Yinjiang Tujia and Miao Autonomous County, Tongren City, Guizhou Province, China

7	Guizhou Provincial Forestry Department	The supervision and management of the province's forestry ecological construction; supervision and management on the protection and development of forest resources; promotion of the forestry reform and safeguard the legitimate rights and interests of farmers engaged in forestry; organization, coordination, guidance and supervision of the province's forest fire prevention work.	No. 91 Yanan Middle Road, Guiyang City, Guizhou Province, China

5.c.3 Conservation planning

The nominated property of Fanjingshan has developed management series relevant plans in relation to its protective designation. (Details see 5.d). These plans based on available facts, set out specific provisions and requirements for the management of the protected areas. During the preparation of the WH nomination, in order to specify more precisely protection measures for the Outstanding Universal Value, the nominated property also formulated the *Management plan*, putting forward measures according to different threats and challenges. (Details see 5.e and Appendix 3)

5.c.4 Zoning conservation

The nominated property of Fanjingshan is protected by Fanjingshan National Nature Reserve, Yinjiang Yangxi Provincial Nature Reserve and National Non-Commercial Forest, and is also divided into different zones to be protected respectively on basis of grades of protection. Most of the nominated property is located in the Fanjingshan National Nature Reserve and Yinjiang Yangxi Provincial Nature Reserve. Based on the importance of values and the objectives for protection; the necessity of property presentation and community utilization; as well as the special qualities, distribution and potential threats the nominated property is zoned as conservation zone, presentation zone and community preservation zone (Figure 5.2).

Conservation Zone: This is defined as an area with high ecological, biological, aesthetic values, as well as values in science and education which reflects the Outstanding Universal Value of the nominated property. It should be protected as a whole. The area must be protected under the strictest conservation regulations. Only essential monitoring and safety facilities and necessary scientific research are allowed in this zone and all industrial activities are prohibited.

Presentation Zone: It is defined as an area with Outstanding Universal Value in science, natural landscape, ecology and biology, of which the sufficient mature condition is to allow

development of facilities for visitor use of the heritage site, science education and tourism. It is the place for scientific research, science education and tourism, where the activities must be consistent with ecological and resource conservation and meet the demand of heritage presentation. Necessary travel service facilities, transportation facilities, and monitoring facilities, signs and protective installations may be set in the zone.

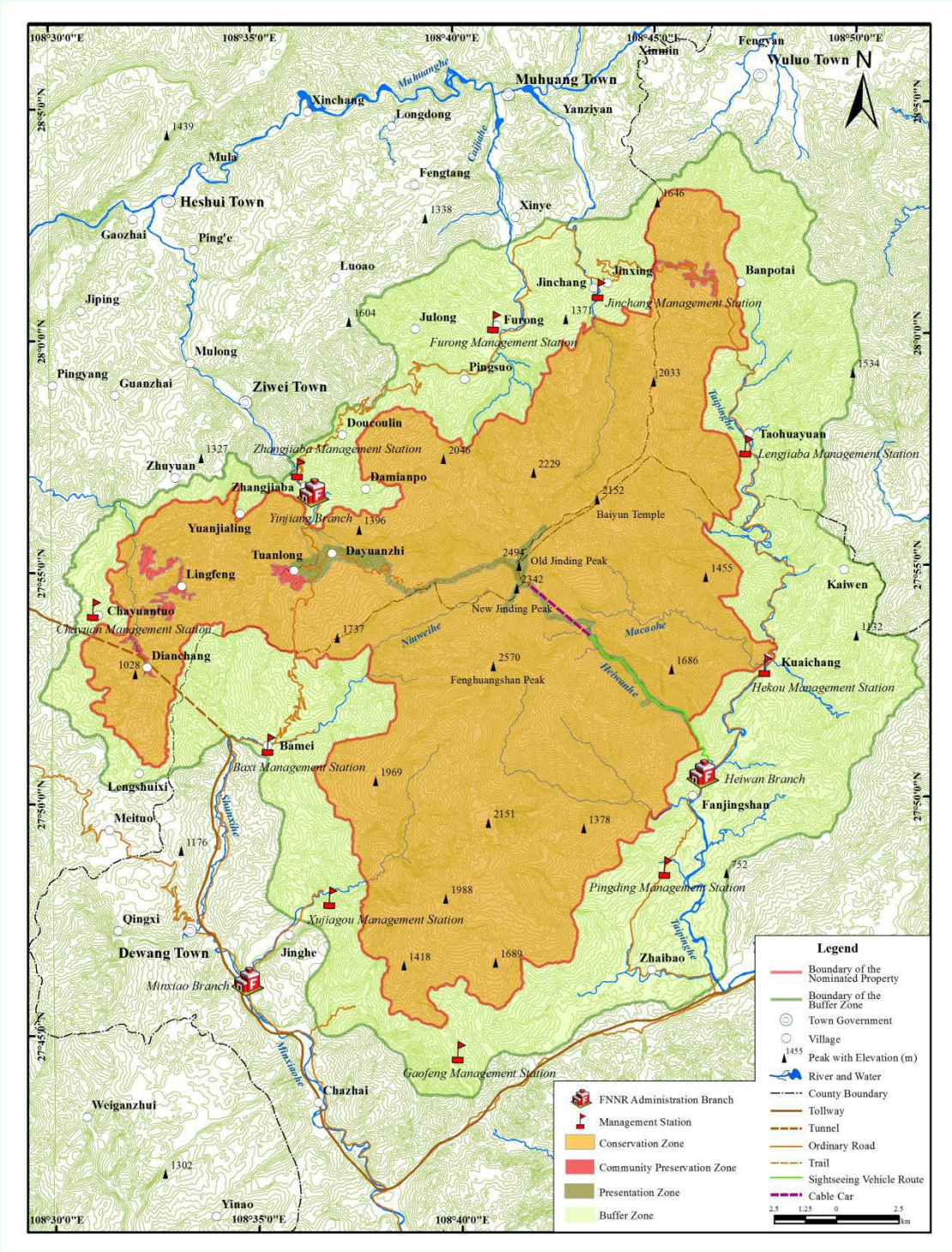


Figure 5.2 Protection Zoning of the Nominated Property of Fanjingshan

Community Preservation Zone: It is defined as a zone with villages that are inadvisable to relocate around the service areas. Considering the development of community and the demand of indigenous residents, production, infrastructure and tourist service facilities in the community preservation zone are allowed if their production activities are in coordination with the environment. Efforts will be made to ensure production only of "nature reserve friendly" products and these can then be branded and marketed at a higher price. Activities such as scientific experiments, teaching activities, visiting, cultivating rare and endangered and medicinal plants, moderate development and utilization of other natural resources are permitted. Traditional agricultural activities may be carried out by the original inhabitants, but all destructive industrial activities are forbidden.

5.c.5 Monitoring

Monitoring protocols are designed to enhance the study of the dynamic processes of Fanjingshan's, geomorphologic integrity, ecological environment, key and indicator animal species, plant species, social economies, populations, geologic disasters, deforestation, tourist quantities, and land uses, etc. in the nominated property. Special attention is given monitoring Guizhou Snub-nosed monkeys (*Rhinopithecus brelichi*) and their habitat. To detect and solve problems in a timely way so as to provide better protection for the nominated property's important values, the nominated property has established monitoring terminal, monitoring station and Wildlife Rescue Center and the corresponding monitoring indicators to periodically and irregularly monitor the resources, find problems and resolve them in time (Details see 6.a).

5.c.6 Local Traditional conservation

Community residents in the nominated property and the buffer zone have been living with the environment harmoniously for long periods and they have inherited and developed some traditional ways to protect nature, and maintain harmony between village and environment. The China Man and Biosphere committee have organized various studies of this valuable ethnobotanical knowledge.

Photo 5.1 Winding path leads to a secluded quiet place

The protective effect of the worship for mountain spirit on ecology: Totem worship of Tujia, Miao, Dong, Gelao people has been practiced for the worship for animals and plants in Fanjingshan, so both totems of fauna and flora and Fanjingshan spirits merged (Zhang, 1997). Miao people said, any behavior causing damage to the mountain and forests are irreverent to the gods, and no such villager can be tolerated (Xing & Ma, 2004). Such worship for Mountain Spirits and totems ensured that the animal resources remain well preserved and intact in ethnic minority regions for centuries. Sacred forest patches were preserved for use as cemeteries, offerings and to ensure “fengshui” luck.

The protective effect of the Buddhist cultural beliefs on ecology: The nominated property is the "Brahma and Sukhavati" that everyone is yearning for. "Tianqingsi Temple Monument", "Tongrenfu Mansion Records" and other existing precious inscriptions and historical literature recorded and revealed the magnificence of Buddhism in the property. People in the nominated property are worshippers and they won’t kill large numbers of wildlife or destroy the mountain aura by deforestation. There are defined ranges for every temple. For example, “excavation is prohibited for Chu people in the range and it’s harmful to temple sacrifice” and Chu businessmen were prohibited from “digging gold dust personally in the mountain field”. Buddhist ecological theory such as "According to the positive choice", "Gather and live together ", “Men were created equally” and “Mercy and fraternity” play an important role in maintaining the ecology of the nominated property.

The protective effect of the lifestyle of indigenous people on ecology: Monument inscriptions such as “Monument Record of Fanjingshan Deforestation Prohibited”, “Monument of Name Spread over the Years” and “Leshichui Monument”, etc. reveal that

the indigenous people have possessed simple dialectic thought, and that they have appreciated the symbiotic relation between water and trees and dependence relation between man and forest, so the local people strongly protect the living environment. Miao and Tujia people who live in Wuling Mountain area particularly cherish natural forests generation after generation, and they have formulated “village regulations and folk laws” of Miao and Tujia People Folk Culture Village in Fanjingshan. The regulations and laws provide that expropriation of land, unauthorized construction, forest and antiques destruction, discharge, concrete pouring and painting out of order are all prohibited to residents. There are articles and provisions of protecting trees in other village regulations and folk laws. For example, setting fire on mountains, stripping tree bark and testing swords or sickles on young trees are all prohibited” (Xing & Ma, 2004). The man who violates these articles will be dealt with by strict sanctions. The sanctions include two aspects, being fined or forced to plant trees in material and being cursed in spiritual aspect. The local Tujia people also formulated an “Afforestation Convention” (Zhang, 1997) and they built steles to express the afforestation.

Unique cultural belief systems and the environmental awareness of indigenous people which formed over a long history, have a positive effect on promoting the protection of the Outstanding Universal Value of the nominated property. Both enhancing the nature conservation awareness of villagers by village regulations and folk laws and improving community management ability and self-discipline play a positive role in the effective management of the local ecological environment, ecological system and natural resources, etc. thus leaving a great ecological wealth to future generations.

5.d Existing plans related to municipality and region in which the proposed property is located

5.d.1 Existing plans related to municipality, county, and region in which the nominated property of Fanjingshan is located

The nominated property have compiled all kinds of relevant plan from different angles and levels before the nomination, and put forward specific provisions and requirements for protection and management (Table 5.4). The compiled plans include *Master Plan on Guizhou Fanjingshan National Nature Reserve (2014-2023), Master Plan of the Guizhou Yinjiang Yangxi Provincial Nature Reserve (2015-2024), Master Plan of Eco-tourism Development of the Guizhou Fanjingshan National Nature Reserve (2014-2023), Conservation Plan on the World's Only Son Rhinopithecus brelichi (2015-2025)* and so on. Among them, *Master Plan on Guizhou Fanjingshan National Nature Reserve (2014-2023)*

has precedence as it is approved by the State Council and is legally binding. For pertinently protecting the Outstanding Universal Value of Fanjingshan, *Fanjingshan Management Plan (2016-2030)* has been compiled after declaration of World Nature Heritage was launched.

Table 5.4 Existing and related plans

Nominated property	Related plan	Prepared by	Adopted date
Fanjingshan	*Master Plan of Guizhou Fanjingshan National Nature Reserve (2014-2023)*	The design institute of forest products industry planning, State forestry administration, Guizhou Fanjingshan national nature reserve	2013.2
	Master Plan of the Guizhou Yinjiang Yangxi Provincial Nature Reserve (2015-2024)	Institute of Forestry Science of Guizhou	2014.12
	Master Plan of the Eco-tourism Development of the Guizhou Fanjingshan National Nature Reserve (2014-2023)	The design institute of forest products industry planning, State forestry administration	2013.10
	Conservation Plan of the World's Only Son Rhinopithecus brelichi (2015-2025)	Guizhou Fanjingshan National Nature Reserve	2014.5

5.d.2 Summary of relevant planning provisions

Master Plan of Guizhou Fanjingshan National Nature Reserve (2014-2023)

Chapter one, the introduction, elaborates Fanjingshan National Nature Reserve's conservation values, the planning background and purposes, basis, types of nature reserve, main protected assets and planning and guiding ideologies, planning principles, planning period, major construction and total investment.

项目编号：YL2013-12

贵州梵净山国家级自然保护区

总体规划

GUIZHOU FANJINGSHAN NATIONAL NATURE RESERVE

MASTER PLAN

（2014～2023 年）

林产工业规划设计院

贵州梵净山国家级自然保护区管理局

2013 年 2 月

Chapter two sets out an overview on Fanjingshan National Nature Reserve, including its geographical location and scope, history and legal status, environment, community situation, land use, infrastructure, and evaluates the value of its protection.

Chapter three expounds the protection status, evaluation and describes the investment, completion status, main achievements of development projects in prior periods; and based on those previous experiences, it summarizes the problems and shortcomings and puts forward improvement measures.

Chapter four sets out planning guidelines and principles to follow, formulates the overall goal, short-term and long-term goals of the planning. According to the nature of the reserve, protected objectives and functional zoning, Fanjingshan Nature Reserve is divided into core area, buffer zone and experimental zone.

贵州印江洋溪省级自然保护区

总体规划

（2015～2024 年）

贵州省林业科学研究院

二〇一四年十二月

Chapter five summarizes the main content of the plan. Based on the implementation of the overall planning of prior period, natural protection and management, monitoring and scientific research, publicity and education, community development and public relations have been improved for the reserve.

Chapters six and seven expound the key project plans and the management organization with its capacity-building plans, including the protection and management of engineering, scientific research and monitoring projects, publicity and education engineering, infrastructure and supporting projects, management mechanism setting principles, organization, personnel preparation, tasks, roles and functions of organization, and proposed capacity building.

Chapters eight, nine and ten describe the estimated investment, the security measures and benefit evaluation, including the scope and basis of investment, estimate investment in construction projects, funding sources, policy support, organizational security, financial security, personnel and technical support, management support, benefit evaluation and comprehensive evaluation.

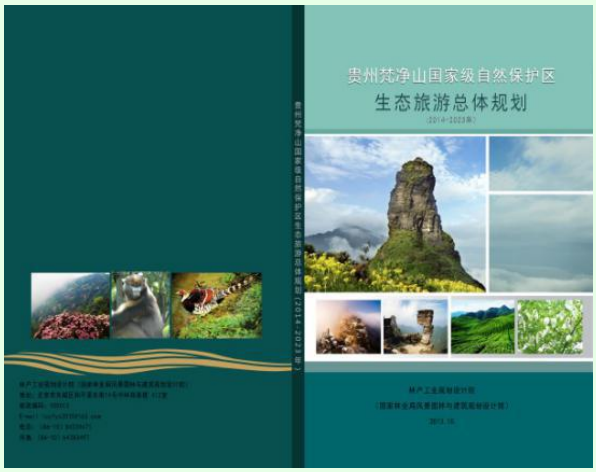
Master Plan of Guizhou Yinjiang Yangxi Provincial Nature Reserve (2015-2024)

The first part is a general introduction, describes the background and need for planning, compilation basis, guiding ideology and principles and planning period. The nature reserve belongs to subtropical evergreen and evergreen deciduous broad-leaved forest ecological system, and the main protected assets include the national key protected rare and endangered species of wild animals, such as muskdeer *Moschus berezovskii,* Serow*,* and goral *Naemorhedus goral*. The national key protected rare and endangered species of wild plants, such as *Taxus chinensis*, *Amentotaxus pilger, Eurycorymbus cavaleriei*, etc. The plan notes that the Yinjiang Yangxi Reserve is adjacent to the Fanjingshan National Nature Reserve, with an ecological environment similar to that of Fanjingshan. Simultaneously, it can provide a broader living space for *Rhinopithecus brelichi* and other

rare animals living in the Fanjingshan Nature Reserve, and is favorable for reproduction and expansion of the population.

Chapter two sets out an overview of Yinjiang Yangxi Provincial Nature Reserve, it has a total area of 21,871.48 ha and lies in the eastern part of the Yinjiang Tujia and Miao Autonomous County, involving 26 administrative villages in 5 townships. This chapter describes the geological geomorphology, hydrology, climate, soil, vegetation, biological resources, social economic status, the historical evolution and legal status in detail.

Chapters three and four elaborate the conservation status of Yinjiang Yangxi Provincial Nature Reserve and types of nature reserve, goals for protection and planning, functional zoning and overall layout. It is committed to construction of the provincial nature reserve, a blend of the functions, such as protection of biological diversity, biological corridor, the protection of water resources, ecological tourism, science education, scientific research and teaching practice, etc.



Chapter five outlines the planning contents of Yinjiang Yangxi Provincial Nature Reserve including protection and management organization, scientific research and monitoring, publicity and education, infrastructure construction, community co-management, eco-tourism and diversified economy. Specifically, the plan prescribes further detailed planning for protection of wild animals and plants, forest fire prevention, disease and insect pest control, ecological restoration and comprehensive management of social security of the reserve, etc., and it also puts forward specific protection measures.

Chapter six to ten elaborate the key construction projects, investment budget, institutional establishment and personnel distribution, capacity configuration, management institution, security measures for planning implementation of and benefit analysis of the Yinjiang Yangxi Provincial Nature Reserve.

Master Plan of the Eco-tourism Development of the Guizhou Fanjingshan National Nature Reserve (2014-2023)

Chapter one sets out an overview on Fanjingshan National Nature Reserve, including the reserve, ecological Tourism Zone, need for planning, general situation of natural geography, social economy and historical culture, and completion of construction projects.

It also highlights the problems or shortcomings about making full use of nature and resources to carry out eco-tourism in the *Master Plan of the Eco-tourism Development of the Guizhou Fanjingshan National Nature Reserve (2014-2023).* This chapter introduces the present management organization, and evaluates the management level and effect, and summarizes the advantages and potential of the ecological tourism planning.

Chapter two expounds the analysis and evaluation, introduces spatial distribution of tourism resources and makes some comments on them. The type and abundance of tourism resources of Fanjingshan are analyzed according to the classification standard *Classification, Investigation and Evaluation of Tourism Resources (GB / T18972-2003);* the Golden Peak scenic spot, Scenery Belt of the East and West Side and other scenic spots, and it makes a comprehensive evaluation on the value of the tourist resources in science, aesthetics, education, culture and other aspects.

Chapter three analyses the tourist market and positioning of the Fanjingshan eco-tourism area, carries out specific analysis on traffic, economic position and tourism market of the eco-tourism area, establishes a win-win situation of protection and development, where the high-end tourism is parallel to mass tourism, tourism industry added value is enhanced and ticket economy translates to industrial economy.

Chapter four expounds general principles of planning. This chapter details the basis, principles, guiding thought, and implementation period and planning guidelines of master planning, explicates eco-tourism orientation, establishes the “brahma pure land” - theme image of the perfect combination of ecological kingdom and Buddhist pilgrimage.

Chapter five gives the overall planning layout. This section expounds the zoning principles of functional partition in accordance with the overall planning, sustainable development, adjustment according to local conditions, and facilitates the construction management division, as well as the characteristics of overall consideration, adjustment according to local conditions, buffer zone conservation, and coordinated control. It notes that the tourism service area, tourist scenic spot, landscape ecological conservation area are controlled separately, that the areas are laid out according to the structure of one core, two belts and multi-points. According to the different visiting access ways, Fanjingshan eco-tourism area is divided into areas of special tourism vehicles, passenger cableways and pedestrian zone. This chapter also makes a status analysis on and plan for eco-tourism land.

Chapter six is the forecast of environmental capacity and tourist scale. This chapter expounds that the area method and path method are used to measure the daily spatial

capacity and annual capacity of eco-tourism area and then to forecast the tourist scale, and to control tourist capacity through incentives and disincentives.

Chapters seven and eight detail the content of construction planning for service areas and scenic spots and planning for eco-tourism products, planning for the Heiwanhe entrance service center, Zhangjiaba entrance service center, the core scenic spot of Jinding, Scenery belt of the east side, Scenery belt of the west side and the building landscape; according to the tourist market positioning. It analyzes the tourism product market demand trends, provides plans for sightseeing tourism products, eco-tourism products, special (humanities) tourism products, leisure tourism products, and planning for the spatial organization of tourism products and also makes explicit the tourism product development sequence.

Chapter nine elaborates the planning for public service facilities in detail, including planning for traffic organization, planning for management and service system, planning for commercial service facilities, planning for identifying facilities, planning for water supply facilities, planning for drainage facilities, planning for electric power facilities, planning for postal service and communication facilities, planning for medical treatment and sanitation, planning for safety & first aid facilities, disaster planning for prevention facilities.

Chapters ten and eleven expound the tourism operation management planning and tourism marketing, describes management planning, guiding ideology, management system, franchise and income distribution, operational management pattern and the management planning for the tourists, local residents, ecological tourist service personnel and ecological tourist area management enterprise in detail, and formulates the differential, intensive and sustainable market competition strategy and marketing strategy.

Chapter twelve elaborates the environmental impact assessment and protection measures. The planning uses the traditional positioning monitoring and tracking monitoring method to monitor the ecological environment monitoring, realize the monitoring on tourists through equipping "mobile detector" and two-way radio system. From both positive and negative aspects, it assesses the environmental impact, and expounds environmental capacity control, ecological resources protection, ecological environment protection and tourism resources protection, ecological environment education and environmental protection measures for major construction projects, etc.

Chapters thirteen, fourteen and fifteen expound the investment estimation and fund-raising, benefit analysis and safeguard measures. It describes the investment

estimation basis and investment project cost estimation, the types of investment and financing channels and means, analyzes economic, social and ecological benefits of the planning in detail, and expounds laws and regulations policy guarantee, organization and management guarantee, financial guarantee, the guarantee of the tourism branding and the publicity and education, safety and health care guarantee.

Conservation Plan of the World's Only Son Rhinopithecus brelichi (2015-2025)

“世界独生子”黔金丝猴

保
护
计
划

(2015－2025 年)

贵州梵净山国家级自然保护区
2014.5

Chapter one describes the geographical location, forest ecosystems and biological diversity of Fanjingshan National Nature Reserve.

Chapters two and three introduce the distribution scope of *Rhinopithecus brelichi* in history and expound the present situation, historic preservation and the future threats to *Rhinopithecus brelichi*.

Chapter four presents a ten-year conservation program for *Rhinopithecus brelichi*, and discusses the purpose and significance. Moreover it plans to protect *Rhinopithecus brelichi* through daily protection measures, personnel training, protection education, scientific research and monitoring and community harmony.

Chapter five describes the budget for the daily protection, personnel training, education, research and monitoring and community coordination, etc.

5.e Property management plan or other management system

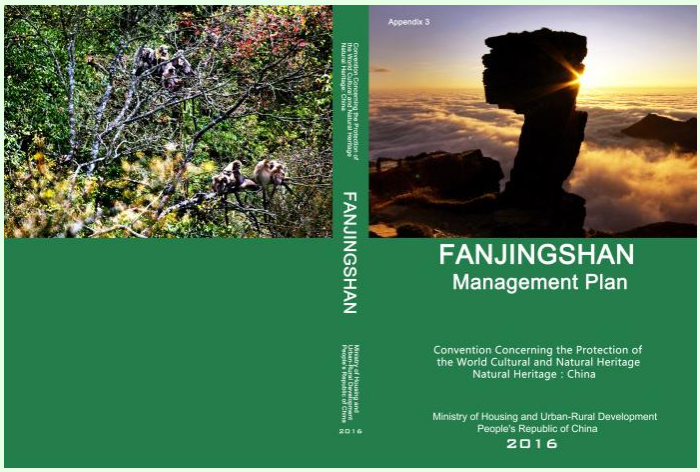
5.e.1 Existing management plan of the nominated property

To meet the requirement of protection and management of the nominated property of Natural World Heritage, the *Management Plan* (Table 5.5) has been compiled. A copy of the plan will be submitted as Appendix 3.

Table 5.5 Existing management plan

Management plan	Compiled by	Approval date
Fanjingshan Management Plan (2016-2030)	Ministry of Housing and Urban-Rural Development of the People’s Republic of China	2016.12.23
	Guizhou Normal University	
	Geographical Society of Guizhou Province	

5.e.2 Explanation of the management plan



This plan ties together the various reserve level and thematic plans noted above and has been prepared in accordance with the requirements of the *World Heritage Convention*, *Operational Guidelines for the Implementation of the World Heritage Convention (2015)* and the *UNESCO Manual for Preparing World Heritage Nominations (2015)*. The plan was compiled by Guizhou Normal University and Geographical Society of Guizhou Province and is coordinated with the relevant laws and regulations. The *Management Plan* is compiled based on sufficient study on the existing plans and coordination with related plans. It puts greater emphasis on the protection, management and maintenance of the outstanding universal values and integrity of the nominated property. It also pays more attention to having the reserves which comprise the nominated area managed as a whole. For the challenges that faced by *Rhinopithecus brelichi*, the integrity of forest ecosystem, the participatory management for rural communities and sustainable development of tourism, the planning proposes feasible countermeasures, including to establish a secondary population of *Rhinopithecus brelichi* in a new isolated site, to improve the monitoring system for alien species and climatic change, guide the modification of community industrial structures, strictly control the number of visitors and the construction of tourist facilities, making sure the Outstanding Universal Value and the integrity of Fanjingshan nominated property remains well protected and preserved (Figure 5.3). This *Management Plan* for the nominated property consists of 13 chapters.

Chapter one gives the scope and duration of the plan, and the guiding ideology, planning basis and principles are introduced in detail.

Chapter two describes the basic information of the nominated property, including the specific location of the nominated property, boundary range of the nominated property and the buffer zone, natural geography, social economic and humanity environment, etc., and sets out a statement of criteria for the integrity of the nominated property, the satisfaction of the nominated criteria and the relevant value attributes.

Chapter three describes the conservation history, conducts assessment on current management of the nominated property, explains the problems and analyzes the threats and challenges of the nominated property briefly.

Chapter four expounds the vision of the planning, and has formulated the short-term, long-term goals, action strategies and the main tasks.

Chapter five focuses on the analysis and assessment of heritage values and management of the nominated property based on the protection of its outstanding ecological processes, biodiversity and aesthetic values, and analyzes the threats and protection pressure, including natural disasters, agricultural activities, felling, grazing, tourism development etc. In order to ensure the long-term protection of the heritage values of the nominated property, the relative countermeasures (for example, effective disaster prevention system, change the traditional mode of production and lifestyles of community residents, provide technology of increasing production and yield for sustainable development, popularize fuel-efficient charcoal stoves and environmentally friendly source of energy, carry out biological and ecological knowledge training) are set out for the threats and challenges. In addition, it analyzes the functional zoning of the nominated property in relation to natural features, values, essentiality, sensitivity, endangered species, needs of heritage presentation and local community utilization etc., and then puts forward corresponding management and control measures.

Chapter six analyzes and evaluates the management of ecology, water, atmosphere, solid waste and noise. It identifies that some problems exist in the nominated property such as domestic sewage discharge, firewood burning, waste disposal, tourist noise etc., and then sets out corresponding protection and management objectives. And, finally, the plan proposes a series of targeted measures, such as closed hillsides to facilitate afforestation, energy saving and emission reduction, development of ecological conservation forest, connecting biogas into people's homes etc.

Chapter seven analyzes and calculates the environmental capacity, and analyzes and evaluates the problems in the number of tourists, tourism facilities management, tourism environment and tourist safety management of the nominated property, and then, puts forward corresponding safe measures.

Chapter eight carries on the detailed analysis on community participation and current development with respect to the nominated property, formulates community participation and development goals, puts forward the construction measures of community from the

aspects of resident point adjustment, industry support, infrastructure establishment, community style guide, community participation action and organization, etc.

Chapter nine analyzes the present status of interpretive displays, publicity and education for the nominated property and presents future development directions.

Chapter ten introduces the research status and achievements, including the future plans which are based on research project collaboration and system construction, scientific research archives management and other aspects of the scientific research of the nominated property. This chapter also carries out a brief description of exchanges and cooperation in scientific research.

Chapter eleven analyzes the Outstanding Universal Value and related values of the nominated property, environmental factors, threatening factors and protection management from the three aspects of monitoring, assessment system and assessment and management of heritage, which have influence on the detection index, protection status and its influences, regular inspection, responsible agencies and resident's participatory evaluation, and proposes the corresponding monitoring and protection measures.

Chapter twelve demonstrates the powerful safeguard measures in the implementation of this plan from the aspects of laws and regulations, organization security, financial security, scientific and technological support and management capacity.

Chapter thirteen sums up the action plan during 2015 to 2030 from six aspects - the protection and management capacity-building, ecological protection, environmental protection and management, construction and sustainable development of the surrounding communities, scientific research projects and related monitoring, promotion, presentation and education. The action plan specifically includes activities related to developing and implementing *Rhinopithecus brelichi* Action Plan; *Abies fanjingshanensis* observation base construction and operation; develop and implement regulation on the building style in the nominated property; and energy saving furnaces/stoves. The budget of the investment funds of the related projects is calculated, and the total investment in the planning projects comes from three channels: the central budget investment, Guizhou provincial budget investment and self-financing. The *Management Plan* has adequate financial support for conserving the nominated property.

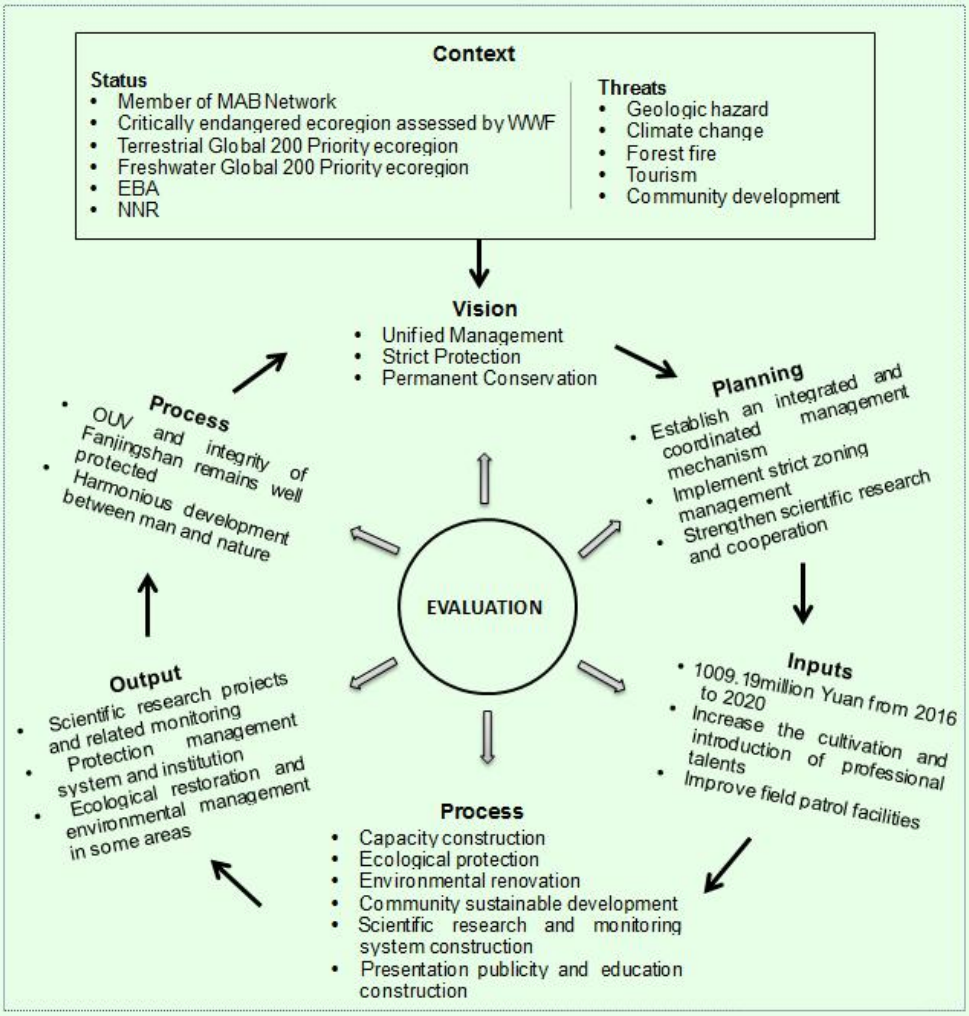


Figure 5.3 Functioning of *Fanjingshan Management Plan (2016-2030)*

5.e.3 Guarantee of effectively implementing management plans and other management systems

(1) Guarantee of laws

The laws and regulations of the People's Republic of China provide a legal basis for conservation of the nominated property, such as *Constitution of the People's Republic of China, Criminal Law of the People's Republic of China (Revision 8), Law of the People's Republic of China on Environmental Protection, Law of the People's Republic of China on Wildlife Protection, Forestry Law of the People's Republic of China, Water Law of the People's Republic of China, Regulations of the People's Republic of China on Nature Reserves, Regulations of the People's Republic of China on the Wild Plants Protection, Regulations of the People's Republic of China on the Implementation of Terrestrial Wildlife Protection, Regulations Concerning Forestry of Guizhou Province, Regulations Concerning Environmental Protection of Guizhou Province, Measures for the*

management of National Non-Commercial Forest, etc. The laws must be observed when conservation and development measures are taken (Details See 5.b.2).

(2) Management organizations

The nominated property has a strong management team and strength, ranging from the Ministry of Housing and Urban-Rural Development of the People's Republic of China and the Department of Forests, to the provincial organizations, such as Department of Housing and Urban-Rural Development of Guizhou Province, Forestry department of Guizhou Province, etc., to the municipal-level ones, including Tongren City People's government, and Leading Group Office for Fanjingshan World Heritage Nomination of Tongren City.

Corresponding management institutions are also established in the nominated property, namely the Administrative Bureau of Fanjingshan National Nature Reserve, the Administrative Bureau of Yinjiang Yangxi Provincial Nature Reserve and Guizhou Provincial Forestry Department is in charge of the National Non-Commercial Forest in the northeast of the nominated property. The regulations stipulate that all institutions must work with an appropriate division to implement the *Management Plan* effectively. This provides an organizational guarantee for the execution of the *Management Plan*

(3) Community participation

Community residents play an important part in the nominated property and its buffer zone. The residents' lifestyles are closely linked to the environment and conservation of the property. With the establishment of different types of reserves, the participation and management abilities of the community residents, enforcement of relevant laws and the ecological awareness of the local people have greatly increased. Consequently, the forest resource management is satisfyingly transformed from passive to active, and community participation in the implementation of the *Management Plan* of the nominated property has been guaranteed.

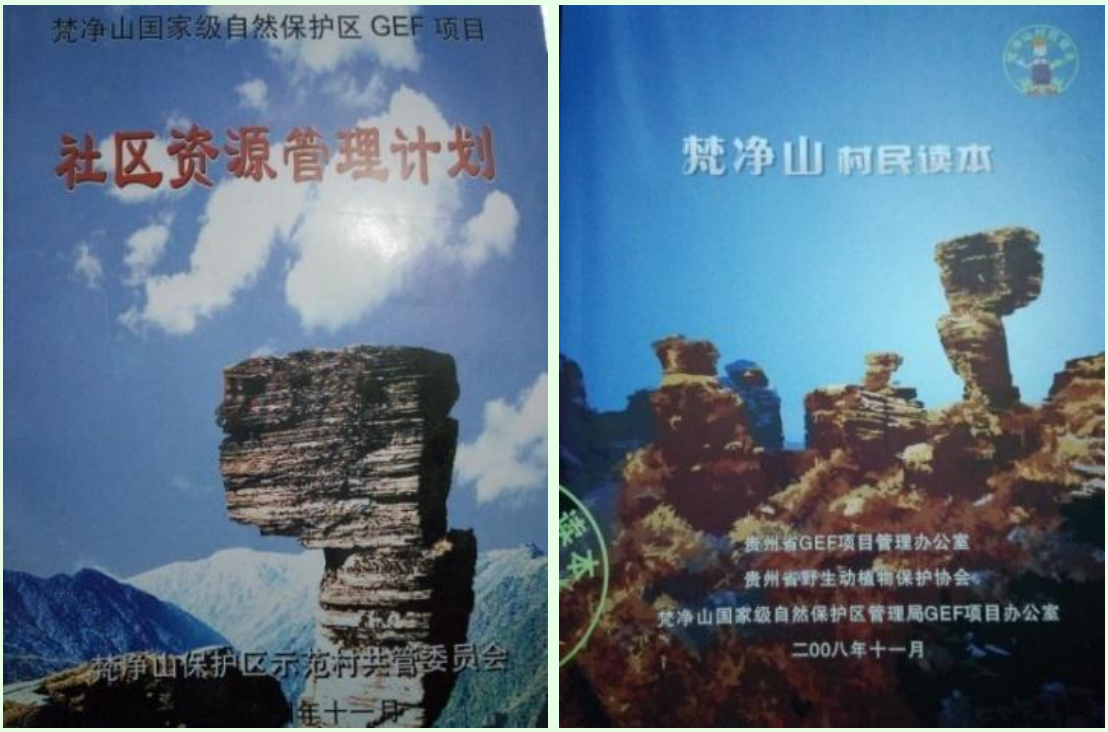


Figure 5.4 ***Community Resource Management Plan and Reading Material of Villagers***

Photo 5.2 Community co-management conference

For example, through the implementation of a natural forest protective project, the community co-management committee and the community nature forest protective network organization have been formed in the nominated property, and their facilities and equipment have been upgraded. The nominated property of Fanjingshan has been engaged in a GEF project to vigorously carry out community co-management activities. Community livelihood alternatives have been developed; the natural energy has been

protected; resource pressure has been reduced, and the organic combination of resource protection and community development realized. In addition, it has also prepared *The Management Plan of the Nature Reserve, Community Resource Management Plan* and *Fanjingshan Villagers Reading* (Figure 5.4). The management ability of the community of the nominated property has been enhanced and local people have participated in forest fire prevention work, and have set up the first rural compulsory fire brigade of Fanjingshan. In addition, the villages also organized a forest duty patrol consisting of 7 people and selected the foresters from the villagers. Community residents have participated in the work of the publicity, supervision and rectification related to forest fire prevention, illegal collection and mining.

5.f Sources and levels of finance

The protection, management and development of the nominated property of Fanjingshan obtains stable financial support from governments at different levels, specially state level and province, so the capital source is relatively sufficient without a big gap, and it can meet the basic needs of management and protection(Table 5.6).

Table 5.6 Finance sources and levels

Year	Sources and levels of finance (*10,000 Yuan)			
	State funds	Special funds	Others	Total
2007	1,800,000			1,800,000
2008	2,310,000			2,310,000
2009	2,560,000			2,560,000
2010	3,000,000			3,000,000
2011	3,500,000			3,500,000
2012	4,000,000			4,000,000
2013	3,300,000	1,000,000		4,300,000
2014	3,700,000	1,200,000		4,900,000
2015	4,450,000	1,350,000		5,800,000
2016	4,700,000	1,500,000		6,200,000

5.g Sources of expertise and training in conservation and management techniques

The nominated property lays emphasis on the education and training of cadres of workers, local people and other partners. Through learning *Forestry Law of the People's Republic of China, Law of the People's Republic of China on the Protection of Wildlife, Regulations on Nature Reserves of the People's Republic of China, Forest Fire Prevention Regulations, Regulation on the Implementation of the Forestry Law of the People's Republic of China, Measures for the management of National Non-Commercial Forest*

and other professional laws and regulations and related policies, all workers have enhanced their sense of responsibility and urgency, strengthened their awareness of the importance of protecting animal and plant resources and maintaining the stability of the ecological system. The main regulatory agency of the nominated property - Administration of Guizhou Fanjingshan National Natural Protection Area established the personnel department, which formulates the training plan for professional and technical personnel, planning, department of science and education which carries out training of forestry administrative law enforcement, department of community coordinated development, and which carries out community public awareness and education activities. As a result, the comprehensive skills and capabilities of management personnel and community residents in the nominated property have been greatly improved.

In addition, through inviting teachers from outside, going out to accept training, holding meetings instead of training and other ways, the education management of cadres of workers is effectively strengthened based on training needs assessment. The technical backbone of the property is developed through many measures: selecting and sending staff to universities and colleges and research units to receive appropriate training and learning skills and knowledge, actively appointing the relevant personnel to participate in the business and technical training organized by superior departments, inviting experts and professors to the nominated property to give training lectures to staff and in other ways, strengthen the capability building of management personnel and forest rangers of the nominated property, improve their professional knowledge, the quality of professional ethics and professional or technical levels. Since the nature reserve was established in the nominated property, there have been nearly 300 staff attendees in natural resources conservation and management, laws and regulations training in different ways; more than 20 people have been selected to participate in training for "nature reserve management", "environmental monitoring", and "wildlife management" in foreign countries; seven have made study trips to the United States, Canada, Europe and other countries to study nature reserve management experience, and another 28 people have participated in the college self - study exam of the "forestry and ecological environment management major". This all lays the foundation of human resources development for the protection of the nominated property.

5.h Visitor facilities and infrastructure

Tourism to the nominated property started quite early but developed slowly. The major tourist focus is on sight-seeing. Since 2009, with the completion of the sight-seeing cableway, its visitor reception capacity has improved greatly, but the overall reception is

still low (Table 5.7). Reception facilities in the buffer zone are centered on the Heiwanhe region. The scale is small, and except the accommodation provided by Qixi Hotel, Longquansi Hotel, Panxi International Conference Center, there is no other starred reception facilities (under Chinese tourism star rating system).

Table 5.7 Tourist facilities

Tourist facility		Amount	Explanation
Explanation/ Interpretation	Trails (km)	27	East, West Stone and wooden plank
	Guides	25	All trained and with tour guide certificate
	Signs	1,454	Scenic spots explanation, warning, instructions
	Publications	24	Guide book, animal and plant introduction, newspapers, etc.
Museum		1	At the East Mountain Gate
Visitor center		2	East, West Mountain Gate ticket office
Overnight accommodation		5	Distributed at the East, West trails
Canteens and places for rest		12	Located in the Fanjingshan Ecological Tourism Area
Shop		4	Located in the Fanjingshan Ecological Tourism Area
Cable car		1	Located between the Yu'ao and the 6100th steps.
Parking lot		5	Located inside the east gate and outside the mountain Yu'ao depression area
Toilet		12	Located in the tourist area and tourist center, under the cableway station
Dustbins		247	Located in the scenic trails and attractions
Searching and rescue station		3	Located in the East, west gate, Golden peak area

5.i Policies and programmes related to the presentation and promotion of the property

The presentation, publicity, protection and management of the nominated property have been incorporated into all aspects of local social and economic development planning and related specific planning so that the status of the sustainable protection of the nominated property can be established.

The office of the Leading Group for Fanjingshan World Natural Heritage Nomination of Tongren City has edited briefs, about the things that the team of experts and related personnel surveyed in the field and held seminars for Fanjingshan world heritage nomination, and then, kept results on file. The office associated with Jiangkou Federation of Literary and Art Circles edited and published the popular brochure on 'Your Guide to Understanding the Fanjingshan Inscription', and it was distributed to peasant households and farmhouse tourism points in the nominated property and its buffer zone. Each ranger,

patrol member speaks to the community on a house to house basis, delivers various publicity materials to tourism companies, restaurants and other institutions, and guides their environmental management. At the same time, staff puts up slogans and makes signs in school and tourist centers to increase publicity. The nominated property has carried out a theme campaign for protection of *Rhinopithecus brelichi,* published the Scientific Survey Set of Fanjingshan, Fanjingshan Research and other academic books, and published a Picture Album on Rare Animals and Plants of Fanjingshan. At present, because of the television, radio, internet and other media have deeply reported the nominated property of ecological processes, biodiversity, aesthetical landscape and other heritage value, its global visibility has increased greatly（Table 5.8）.

Table 5.8 Statistics of media publicity

Time	Media name	Column	Film content
May 17, 2009	CCTV-3, CCTV net	Happy China	Charm Fanjingshan
April 28, 2010	Heilongjiang TV, major video websites	Benshan Happy Camp	Zhaosi guide Fanjingshan
August 13-15, 2010	CCTV-4	Discover China	Fanjingshan album
August 12-15, 2010	CCTV-10	Explorations	Fanjingshan topics
April 8, 2011	CCTV-9, major video websites	Human Geography	Looking *Rhinopithecus brelichi*
October 21, 2012	Tudou, Ku 6	Life	Three special cable-way cup of trek across Guizhou Fanjingshan station
May 24, 2013	CCTV-9, major video websites	Geo-China	"Indeed god beast" Mystery
February 5-8, 2014	CCTV-9, major video websites	Documentaries	Mountain spirit
April 21, 2014	Hubei Economic TV	Jing Shi Live	Fanjingshan: Cloud mountain and fog cover of pure time
October 2, 2014	CCTV-13	Beauties in our Country	Tongren Fanjingshan: odd mountain rocks, rising wind and scudding clouds
October 3, 2014	CCTV-13	Live News Room	Through scenic spots: close to the beauty, do not forget civilization
December 27, 2014	iQIYI web	Documentaries	Feral Asia of China: Fanjingshan

The nominated property, depending on institutes and universities, constantly strengthens the scientific study and explores and discovers more values within the nominated property. There are 9 published books such as *the Scientific Set of Fanjingshan*, *the Study of*

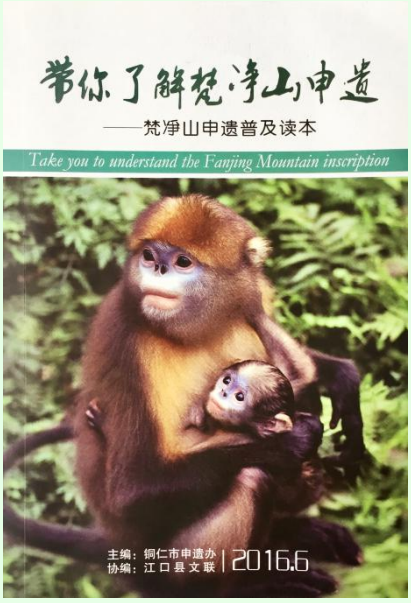
Fanjingshan and *the Wild Ecology of Rhinopithecus brelichi; the Picture Album of Rare Animals and Plants of Fanjingshan* has been drawn and about 800 research papers have been published. All of these scientific achievements lay a solid foundation for adding to knowledge on the Outstanding Universal Value and formulating reasonable protection and management measures for the nominated property. The nominated property joined the international biosphere network of the UNESCO in 1986 and exchanges information with UNESCO and other relevant biosphere reserves. Experts and scholars at home and abroad are often invited to the nominated property to attend all kinds of seminars, in order to increase the academic exchange and technical consultation and provide suggestions on the best practices for protection of animal and plant resources such as *Rhinopithecus brelichi*, *Fagus longipetiolata*, *Davidia involucrata*, *Abies fanjingshanensis,* etc., also the ecological environment and Buddhist culture of the nominated property. Training for the management personnel has been carried out and a long-term cooperation with Primate Research Centers in Germany, San Diego State University and The Wildlife Conservation Society has been established.

Photo 5.3 Information signs of the nominated property and the buffer zone

Table 5.8 Statistics of media publicity

Time	Media name	Column	Film content
May 17, 2009	CCTV-3, CCTV net	Happy China	Charm Fanjingshan
April 28, 2010	Heilongjiang TV, major video websites	Benshan Happy Camp	Zhaosi guide Fanjingshan
August 13-15, 2010	CCTV-4	Discover China	Fanjingshan album
August 12-15, 2010	CCTV-10	Explorations	Fanjingshan topics
April 8, 2011	CCTV-9, major video websites	Human Geography	Looking *Rhinopithecus brelichi*

October 21, 2012	Tudou, Ku 6	Life	Three special cable-way cup of trek across Guizhou Fanjingshan station
May 24, 2013	CCTV-9, major video websites	Geo-China	"Indeed god beast" Mystery
February 5-8, 2014	CCTV-9, major video websites	Documentaries	Mountain spirit
April 21, 2014	Hubei Economic TV	Jing Shi Live	Fanjingshan: Cloud mountain and fog cover of pure time
October 2, 2014	CCTV-13	Beauties in our Country	Tongren Fanjingshan: odd mountain rocks, rising wind and scudding clouds
October 3, 2014	CCTV-13	Live News Room	Through scenic spots: close to the beauty, do not forget civilization
December 27, 2014	iQIYI web	Documentaries	Feral Asia of China: Fanjingshan



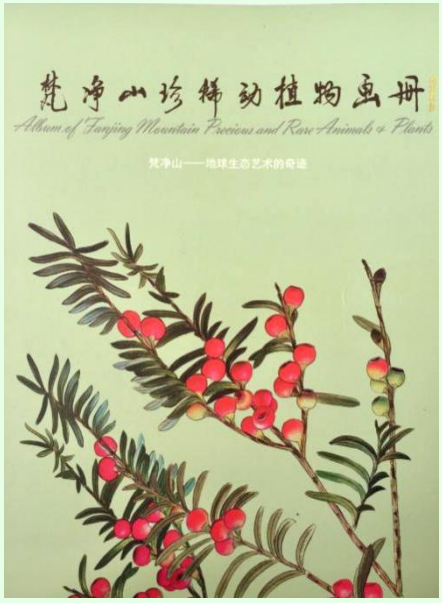


Photo 5.4 Publicity of the booklets *Take You to Understand the Fanjingshan Inscription, Picture Album on Rare Animals and Plants* and the popular science exhibition about the value

5.j Staffing levels and expertise (professional, technical, maintenance)

There is currently 633 staff in the nominated property of Fanjingshan (Table 5.9).

The Administration of Guizhou Fanjingshan National Nature Reserve of the nominated property, as a fully funded institution, has a staff of 86, including 13 administrative personnel, 12 scientific researchers, 29 law enforcement officials of forest administration, 26 police from the public security and 6 general workers. There are 28 personnel who hold technical qualifications including 1 researcher, 5 senior engineers, 7 engineers, 15 with primary title.

The Yinjiang Autonomous County Nature Reserve Management Center in the Forestry Bureau of Yinjiang Autonomous County is in charge of the business, and Chayuan Area is in charge of the daily management work. Chayuan has 1 station head, 4 staff, among whom; one has the title of engineer and four have the title of assistant engineer.

Guizhou Provincial Forestry Department is in charge of the National Non-Commercial Forest in the northeast of the nominated property. Guizhou Provincial Forestry Department has 78 staffs, including 20 Forest Public Security Bureau political and law special staffs. There are 1 Director, 4 Deputy Director-General, 1 chief engineer, 1 Party Secretary of Departments, 23 leaders.

Guizhou Fanjingshan National Nature Reserve Administration is the owner unit of Guizhou Sante Fanjingshan Tourism Development Limited Corporation and its affiliated subsidiaries, and relevant government departments, such as Tongren Municipal Bureau of quality and technical supervision, etc., are their competent units. The company, founded in 2004, now consists of 464 staff, has set up an engineering department, scenic service department, security team, cleaning department, interpretation service department, etc., and is mainly responsible for Fanjingshan tourism projects on investment and construction, the operation and management of Fanjingshan, scenic spot garbage cleaning and transportation, sewage treatment, forest fire prevention security, etc., and promotes the display and protection of Outstanding Universal Value of in the nominated property.

The administrators of the nominated property pay special attention to the improvement of the quality of the personnel and their training and professional development. A variety of training has been carried out including through short seminars, training at high levels, position education, and posting to various World Natural Heritage sites.

Table 5.9 Management personnel

Professional management personnel and technique personnel						**Other formal personnel**
Post structure	Administrative personnel	Scientific personnel	Law enforcement officials of forest administration	The public security polices	Workers	464
	47	28	49	26	6	
Level of education	Bachelor degree or above	Junior college	Technical secondary school and high school		Junior middle school and below	
	56	69	37		10	
Total: 633						

6. Monitoring

6.a Key indicators for measuring state of conservation
6.b Administrative arrangements for monitoring property
6.c Results of previous reporting exercises

6. Monitoring

6.a Key indicators for measuring state of conservation

Monitoring systems have been established in the nominated property of Fanjingshan by local departments based on types of resources, protection state, and heritage management requirements. The main monitoring indicators are elaborated as follows (Table 6.1).

Outstanding Universal Value monitoring: It mainly involves monitoring of Outstanding Universal Value elements, including monitoring of the abundant biodiversity in the nominated property, especially paying close attention to the community populations and their dynamics, the age structure, the individual diffusion and other characteristics of *Rhinopithecus brelichi*, *Abies fanjingshanensis* and other rare and endangered species, endemic species, ancient relict species and type specimens of species; monitoring of the integrity of ecological system, ecological regime of forests and vegetation and alien species; and monitoring of geomorphologic landscape and vegetation landscape.

Visitor monitoring: It includes monitoring of number and structure of visitors and degree of satisfaction, observational monitoring of tourism items, sightseeing areas, service facilities and quality of tourism, and development and impacts from tourism activities (litter, toilets, noise, damage).

Environmental quality monitoring: It includes observation and evaluation of air and water quality, noise, soil, environment sanitation.

Natural disaster monitoring: It includes GIS observational monitoring and timely response to meteorological disasters, forest fire (even though it happens very rarely), landslide, mud-rock flow, and insect infestations, etc.

Human activity monitoring: It includes GIS observational monitoring of poaching, forest cutting, engineering construction, construction, land use change and population encroachment and change, etc.

Settlement and village monitoring: It includes GIS observational monitoring of villages and resident populations of the buffer zone, village construction, and economic development, etc.

Table 6.1 Monitoring Indicators

Monitoring indicators	Periodicity	Location of records
Size and boundary of Fanjingshan National Nature Reserve	Irregularly scheduled	Administration of Guizhou Fanjingshan National Nature Reserve
Ecosystem diversity and dynamic changes	Long term	Administration of Guizhou Fanjingshan National Nature Reserve, Guizhou Academy of Sciences
Geomorphic processes and landscape	Irregularly scheduled	Administration of Guizhou Fanjingshan National Nature Reserve and Guizhou Normal University
Rhinopithecus brelichi and its habitat	Seasonally	Administration of Guizhou Fanjingshan National Nature Reserve
Animals species and population	Every 5 years	Administration of Guizhou Fanjingshan National Nature Reserve, Forestry Bureau of Tongren, Guizhou Province, Forestry Bureau of Jiangkou County, Forestry Bureau of Yinjiang Tujia and Miao Autonomous County, Forestry Bureau of Songtao Miao Autonomous County
Plants species and population	Every 5 years	Administration of Guizhou Fanjingshan National Nature Reserve, Forestry Bureau of Tongren, Guizhou Province, Forestry Bureau of Jiangkou County, Forestry Bureau of Yinjiang Tujia and Miao Autonomous County, Forestry Bureau of Songtao Miao Autonomous County
Alien species and impact	Long term	Administration of Guizhou Fanjingshan National Nature Reserve, Forestry Bureau of Tongren, Guizhou Province, Forestry Bureau of Jiangkou County, Forestry Bureau of Yinjiang Tujia and Miao Autonomous County, Forestry Bureau of Songtao Miao Autonomous County
Forest fire control and Forest diseases and insect pests	Long term	Administration of Guizhou Fanjingshan National Nature Reserve, Forestry Bureau of Tongren, Guizhou Province, Forestry Bureau of Jiangkou County, Forestry Bureau of Yinjiang Tujia and Miao Autonomous County, Forestry Bureau of Songtao Miao Autonomous County
Number and structure of tourists, degree of satisfaction	Daily	Tongren Fanjingshan tourism development investment (Group) Co., Ltd., Tourist Bureau of Tongren, Guizhou Province, Tourist Bureau of Jiangkou County, Tourist Bureau of Yinjiang Tujia and Miao Autonomous County, Tourist Bureau of Songtao Miao Autonomous County
tourism project, visitor facilities	Annually	Tongren Fanjingshan tourism development investment (Group) Co., Ltd., Tourist Bureau of Tongren, Guizhou Province, Tourist Bureau of Jiangkou County, Tourist Bureau of Yinjiang Tujia and Miao Autonomous County, Tourist Bureau of Songtao Miao Autonomous County
Surface water quality and	Monthly	Environmental Protection Administration of Tongren,

water quantity		Environmental Protection Administration of Jiangkou County, Environmental Protection Administration of Yinjiang Tujia and Miao Autonomous County, Environmental Protection Administration of Songtao Miao Autonomous County, Water Conservancy Administration of Tongren, Water Conservancy Administration of Jiangkou County, Water Conservancy Administration of Yinjiang Tujia and Miao Autonomous County, Water Conservancy Administration of Songtao Miao Autonomous County
Quality of atmosphere	Daily	Environmental Protection Administration of Tongren, Environmental Protection Administration of Jiangkou County, Environmental Protection Administration of Yinjiang Tujia and Miao Autonomous County, Environmental Protection Administration of Songtao Miao Autonomous County
Noise impact	Seasonally	Environmental Protection Administration of Tongren, Environmental Protection Administration of Jiangkou County, Environmental Protection Administration of Yinjiang Tujia and Miao Autonomous County, Environmental Protection Administration of Songtao Miao Autonomous County
Change of soil property	Irregularly scheduled	Tongren Land Resources Bureau, Jiangkou County Land Resources Bureau, Land Resources Bureau of Yinjiang Tujia and Miao Autonomous County, Land Resources Bureau of Songtao Miao Autonomous County
Poaching	Long term	Administration of Guizhou Fanjingshan National Nature Reserve
Engineering construction	Long term	Administration of Guizhou Fanjingshan National Nature Reserve
Land use	Annually	Administration of Guizhou Fanjingshan National Nature Reserve, Tongren Land Resources Bureau, Jiangkou County Land Resources Bureau, Land Resources Bureau of Yinjiang Tujia and Miao Autonomous County, Land Resources Bureau of Songtao Miao Autonomous County
Local community (village, resident population, farmland area, employment status, etc.)	Annually	Administration of Guizhou Fanjingshan National Nature Reserve, Tongren Statistics Bureau, Jiangkou County Statistics Bureau, Statistics Bureau of Yinjiang Tujia and Miao Autonomous County, Statistics Bureau of Songtao Miao Autonomous County
Impact from community development project	Long term	Administration of Guizhou Fanjingshan National Nature Reserve
Community participation	Long term	Administration of Guizhou Fanjingshan National Nature Reserve

6.b Administrative arrangements for monitoring the property

In order to ensure long-term effective protection and management of the nominated property of Fanjingshan, the property management agencies have established a comprehensive monitoring system with the involvement of a wide range of relevant administrative agencies, such as, the Local Agriculture Agency, Tourism Department, Water Conservancy Bureau, National Land Resource Bureau, Statistics Bureau, universities and colleges. Each performs their own duties and monitors related elements, coordinating work in an efficient and orderly manner (Table 6.2).

Table 6.2 Administrative departments responsible for monitoring

Agencies responsible for the monitoring	Contact		
	Contact number	Address	Postal code
Administration of Guizhou Fanjingshan National Nature Reserve	+86-0856-6620157	No.17, Sanxing Road, Jiangkou County, Guizhou Province	554400
Guizhou Normal University	+86-0851-6690478	No.116, Baoshan North Road, Guiyang, Guizhou Province	550001
Forestry Bureau of Tongren	+86-0856-5223289	No.009, Jiulong Road, Kaifa District, Tongren, Guizhou Province	554300
Forestry Bureau of Jiangkou County	+86-0856-6621143	No.2, Huancheng North Road, Jiangkou County, Tongren, Guizhou Province	554400
Forestry Bureau of Yinjiang Tujia and Miao Autonomous County	+86-0856-6222385	Zhenxing Road, Eling Village, Tongren, Guizhou Province	555200
Forestry Bureau of Songtao Miao Autonomous County	+86-0856-2838173	No.7, Nanmenwan, Liaoao Village, Tongren, Guizhou Province	554100
Tongren Fanjingshan Tourism Development Investment (Group) Co., Ltd.	+86-0856-3930588	No.52, Jiefang Road, Tongren, Guizhou Province	554300
Tourist Bureau of Tongren	+86-0856-5284051	No.319, Dongtaida Road, Tongren, Guizhou Province	554300
Guizhou Province, Tourist Bureau of Jiangkou County	+86-0856-6621012	No.29, Sanxing East Road, Jiangkou County, Tongren Guizhou Province	554400
Tourist Bureau of Yinjiang Tujia and Miao Autonomous County	+86-0856-6222156	Xianfu Road, Yinjiang Tujia and Miao Autonomous County, Tongren Guizhou Province	555200

Tourist Bureau of Songtao Miao Autonomous County	+86-0856-2830342	No.23, Renmin Road, Liaoao Village, Songtao Miao Autonomous County, Tongren, Guizhou Province	554100
Environmental Protection Administration of Tongren	+86-0856-5238228	No.65, Huandong Road, Bijiang District, Tongren, Guizhou Province	554300
Environmental Protection Administration of Jiangkou County	+86-0856-6627609	Hebin North Road, Tongren, Guizhou Province	554400
Environmental Protection Administration of Yinjiang Tujia and Miao Autonomous County	+86-0856-6230570	No.168, Renmin Road, Yinjiang Tujia and Miao Autonomous County, Tongren, Guizhou Province	555200
Environmental Protection Administration of Songtao Miao Autonomous County	+86-0856-2831461	No.26, Gongyuan Road, Liaoao Village, Songtao Miao Autonomous County, Tongren, Guizhou Province	554100
Water Conservancy Administration of Tongren	+86-0856-5210408	No.58, Huandong Road, Tongren, Guizhou Province	554300
Water Conservancy Administration of Jiangkou County	+86-0856-6621426	Hebin East Road, Shuangjiang Village, Jiangkou County, Tongren, Guizhou Province	554400
Water Conservancy Administration of Yinjiang Tujia and Miao Autonomous County	+86-0856-6221210	Ejiang Road, Yinjiang Tujia and Miao Autonomous County, Tongren, Guizhou Province	555200
Water Conservancy Administration of Songtao Miao Autonomous County	+86-0856-2830014	No.64, Liaoao Village North Road, Songtao Miao Autonomous County, Tongren, Guizhou Province	554100
Tongren Land Resources Bureau	+86-0856-5234999	Administrative office building, Dongtaida Road, Tongren, Guizhou Province	554300
Jiangkou County Land Resources Bureau	+86-0856-6621101	Minsu Street, Jiangkou County, Tongren, Guizhou Province	554400
Land Resources Bureau of Yinjiang Tujia and Miao Autonomous County	+86-0856-6222351	Jiefang Road, Yinjiang Tujia and Miao Autonomous County, Tongren, Guizhou Province	555299
Land Resources Bureau of Songtao Miao Autonomous County	+86-0856-2830251	South Gate of Liaoao Village, Songtao Miao Autonomous County, Tongren, Guizhou	554100

		Province	
Tongren Statistics Bureau	+86-0856-5223678	No.14, Huaguoshan Middle Road, Bijiang District, Tongren, Guizhou Province	554300
Jiangkou County Statistics Bureau	+86-0856-6621305	Sanxing East Road, Jiangkou County, Tongren, Guizhou Province	554400
Statistics Bureau of Yinjiang Tujia and Miao Autonomous County	+86-0856-6222213	No.72, Jiefang Road, Eling Village, Yinjiang Tujia and Miao Autonomous County, Tongren, Guizhou Province	555200
Statistics Bureau of Songtao Miao Autonomous County	+86-0856-2830294	No.67, Jiaochangba Road, Liaoao Village, Songtao Miao Autonomous County, Tongren, Guizhou Province	554100

6.c Results of previous reporting exercises

To better understand the resource value and long-term effective protection and management of the nominated property, the property management agencies have conducted a wide range of cooperation with scientific institutes and universities and colleges in research and monitoring works in Fanjingshan, which covers *Rhinopithecus brelichi*, *Abies fanjingshanensis, Davidia involucrata, Fagus lucida*, distribution of plants and animals, climatic characteristics and other aspects, providing a basis for scientific decision-making of the protection and management of Fanjingshan (Table 6.3).

Table 6.3 Results of previous reporting exercises

Records	Contents	Bearers	Location of records
Wild population structure and dynamic characteristics of the endangered plant *Abies fanjingshanensis*	As a first class national protected plant, *Abies fanjingshanensis* is a rare and endangered plant endemic to Guizhou with a very small population. Two patches were chosen to reveal the characteristics of the population structure in this study. Age structure was analyzed, and the population structure type was determined quantitatively. The population dynamics were predicted by time sequence model, and differences and similarities in the habitats were compared. The results showed that: (1) The population of	Li Xiaoxiao, Wang Qingchun, Cui Guofa, Yang Chuandong	*Acta Botanica Boreale-Occidentalia Sinica,* 2011,31(7): 1479 -1486

	A.fanjingshanensis presented as a growing type and V_{pt}'= 0.005 9, which showed its population tended to be a stable type. The population structure showed volatility during development, and there were more trees in early growth stage than that in late growth stage. The survival curve approached to Deevey-Ⅲ. The shortage of young seedlings and the high mortality of young trees and sapling trees may be an important reason of being endangered. (2) The time sequence model predicted that the population of *A. fanjingshanensis* was able to keep stable, and the population would have a light rising tendency in the coming 2, 4 and 6 age classes. (3) In different habitats, the characteristics of population structure had little difference. The growth of population structure in habitat 1 was slightly larger than that in habitat 2.		
Life table and survival analysis of natural *Davidia involucrata* population in Fanjingshan Nature Reserve, Guizhou Province of Southwest China	Based on the population life table and the theory of survival analysis, and by using the age class structure represented by DBH (diameter at breast height) class and the stage-smoothing technique, a specific life table of *Davidia involucrata* population in Fanjingshan Nature Reserve was compiled, and the mortality rate curve, killing power curve, survival rate curve, and survival function curve were analyzed, aimed to reveal the quantitative dynamics of the population. There was a fluctuation in the structure of the *D. involucrata* population. The survival curve of the population appeared to be of Deevey Ⅲ type, and the individuals at young stage were abundant. The mortality rate curve and disappearance rate curve in the lifespan had similar variation trend, and the population had two distinct peaks of mortality, *i. e.*, from Ⅰ to Ⅱ age class and	Wu Mingkai, Shen Zhijun, Liu Hai, etc.	*Chinese Journal of Ecology*, 2012,31(6): 1419-1424

	from Ⅷ to Ⅸ age class. The survival analysis showed that the population mortality rate was increasing all along, while the survival rate was decreasing all the time. After Ⅷ age class, the mortality rate would exceed 92%, and the survival rate would decrease to below 8%, which indicated that hazard rate surpassed survival rate. The survival functional curve showed that the individual number of the population decreased rapidly in early age period, was stable in middle age period, and declined in old age period. The high mortality of seedlings and the deficiency of middle-age trees could be the main reasons why the *D. involucrata* population becomes endangered.		
The investigation and exploitation of Rubus L. resources of Fanjingshan Nature Reserve Guizhou Province	Investigation of the distribution range and habitat, etc. on wild *Rubus* plants has been carried out in Fanjingshan nature reserve. Among 31 species and 2 varieties collected, *R.fanjingshanensis* is an endemic species, *R.lasiostylus, R. playfairianus* and *R.pentagonus Wall. Ex Focke* var. *modestus* are the new record species, *R.trianthus, R.corchorifolius, R.ichangensis* and *R.caudifolius* are species with the largest distribution; *R.lasiostylus, R. sumatranus, R.ichangensis and R.caudifolius* has a high value in use and a good development prospect. The utilization potential of these plants in this nature reserve has been estimated too.	Zhu Yinan, He Jiawei, Yang Zhengsong, etc.	*Chinese Agricultural Science Bulletin*, 2007,23(9): 504-508
Vegetation distribution in Fanjingshan National Nature Reserve and habitat selection of *Rhinopithecus brelichi*	Vegetation type indicated that the broadleaf evergreen and deciduous mixed forests, the broadleaf evergreen forests were the main vegetation selected by Guizhou Snub-nosed monkeys (*Rhinopithecus brelichi*).	Yang Hailong, Li Diqiang, Duo Hairui, etc.	*Forest Research*, 2010,23(3): 393-398

Distribution of Taxus chinensis var mairer resource in Fanjingshan Natural Reserve	*Taxus chinensis* var. *mairer* resource in Fanjingshan Natural Reserve has a small distribution area, about 1.35ha and a small quantity, about 757 trees. The *Taxus chinensis* var. *mairer* resource mainly distributed in Moso bamboo forest, secondary coniferous and broad-leaved mixed forest and artificial *Taxus chinensis* var. *mairer* forest below an elevation of 1150m in eastern, northeastern and southwestern of Fanjingshan Natural Reserve and a small number of *Taxus chinensis* var. *mairer* trees distribute in shrub forest and around farmers' houses. The distribution rates of *Taxus chinensis* var *mairer* resource in Moso bamboo forest, secondary coniferous and broad-leaved mixed forest, artificial *Taxus chinensis* var. *mairer* forest, shrub forest and around farmers' houses were 47.56%, 25.76%, 17.83%, 5.42% and 3.43% respectively.	Wang Yan, Yao Songlin, Qi Xiang, Etc.	*Southwest China Journal of Agricultural Sciences*, 2009,22(4): 1073-1076
A study on distribution pattern of an epiphytic bryophyte, *Dolichomitriopsis diversiformis* (Lembophyllaceae) on Tree Trunks in forest in Fanjingshan of Guizhou	The distribution pattern of *Dolichomitriopsis diversiformis* in Fanjingshan showed that the community-wide distribution of epiphytic *D. diversiformis* is well correlated with forest community types. The forest communities with this species can be divided into six groups, which are *Cyclobalanopsis stewardiana- Sinarundinaria nitida* community, *Cyclobalanopsis stewardiana+ Quercusengleriana+ Carpinus viminea-Sinarundinaria nitida* community, *Cyclobalanopsis stewardiana-Euryia brevistyla* community, *Rhododendron ririei+ Cyclobalanopsis multinervis-Illicium simonsii* community, *Fagus lucida+ Cyclobalanopsismultinervis+ Cyclobalanopsis stewardiana-Sinarundinaria nitida* community and *Cyclobalanopsis stewardiana-Camellia*	Liu Bing, Jiang Yefang, Li Qiing, etc.	*Acta Botanica Yunnanica*, 2006,28(2): 169-174

	cuspidata-Illicium simonsii community respectively. The vertical distributive range of this species is 1 650- 2 080 m above sea level; the vertical distribution of this species on tree trunks is that the quantity of this species on the lower parts are significantly more than that on the middle parts while that on the middle parts are significantly more than that on the upper parts; the distribution of this species among different tree species is remarkably different. The ecological factors influencing the distribution of epiphytic *D. diversiformis* in Fanjingshan were also analyzed and discussed.		
Investigation of conservation plants of Fanjingshan in forest ecosystem research station	According to the biological and ecological characteristics of Fanjingshan and the important part of rare and endangered plants respectively, the Fanjingshan Ecological Station in Guizhou Academy of Sciences has been built for test for 20 years in Fanjingshan and along with Heiwan River Base of Jiangkou County. The results show that the 103 species (including subspecies) have been introduced and survived, belonging to 46 families. Conservation of rare and endangered plants and some important economic plants have been kept. Today *Davidia involuclata* var. *vilmoriniana, Davidia involucrate, Taxus chinensis* var. *mairei, Osmanthus fragrans, Michelia cavaleriei, Magnolia officinalis, Lagerstromia excels, Camellia pitardii, Acer davidii, Styrax odoratissimus, Machilus lichuanensis, Dendronbium fanjingshanense* have already been flowering and fruiting. Their growth performance is good. This provides a certain technical reserve for the diversity conservation of other plants in Fanjingshan.	Zhang Yuwu, He Yunsong, Liu Yingying, etc.	*Guizhou Science*, 2015,33(1): 85-91

Habitat suitability evaluation for *Rhinopithecus brelichi* in Fanjingshan, Guizhou Province	It was found that, without human activities being considered, 204.53 km^2 (accounting for 47.27% of the total area) of the total area is suitable for *Rhinopithecus brelichi* to live, while unsuitable area covers 229.00 km^2 (accounting for 52.73% of the total area).	Yang Hailong, Li Diqiang, Cheng Gang, etc.	*Journal of Anhui Agricultural Sciences*, 2013,41(8): 3403-3406
The studies on flora and ecological features of Liana in Fanjingshan National Nature Reserve, Guizhou, China-attach a list of Liana in the Fanjingshan	In this paper, the author has studied the flora and ecological features of liana in Fanjingshan. The results showed: (1) There are 253 species of climbing liana belonging to 45 families, 89 genera. (2) The liana flora has originated since ancient time and is very complex in this area. Liana species may be divided into 18 areal types or subtypes, among which the tropical elements account for 55.96%, the temperate elements for only 42.1% and the endemic elements for 1.83% in Fanjingshan. (3) Perennial liana account for 98.42%, and annually 1.58%; ligneous liana account for 79.05%, and herbaceous liana for 20.95%; Evergreen liana account for 59.44%, and defoliated liana 37.75%, and half evergreen liana 2.81%. (4) The distribution situation of the liana has a very close relation with vegetation type, soil, elevation above sea level, humidity and temperature. The different liana distribute in different forest types. A number of species of liana decrease with altitudes and increase in different forest types. Different liana can be divided into lower, middle and subalpine mountain types. (5) In the end of this paper, the author has also compiled "*A List of Liana of the Fanjingshan*".	Zhang Yuwu, Yang Hongping	*Journal of Wuhan Botanical Research*, 2001,19(4): 269-298
The characteristics of Pteridophytes flora in Mt. Fanjingshan	To explore the characteristics of pteridophytes flora in Fanjingshan Nature Reserve, we investigate the diversity of Pteridophytes species by field works, specimen identification and reference	Wang Hui, Wei Qi, Wu Feifei, etc.	*Journal of Guizhou Normal University (Natural Sciences)*, 2014,32(4): 22-28

Nature Reserve	collating, and analyze areal-types of genera and species of Pteridophytes in this property. Major results are as follow: 1) There are totally 28 families, 87 genera, 324 species, 7 varieties and 3 forma of Pteridophytes in Fanjingshan Nature Reserve. 2) Analysis of Pteridophytes flora on genera shows that Pteridophytes flora on genera level has an obvious tropical character, but temperate genera also influences the characteristics of genera flora to some degree. 3) Analysis of Pteridophytes flora on species shows that Pteridophytes flora on species level have temperate character in Fanjingshan Nature Reserve, Pteridophytes flora in this area are located in the east wing of East Asia Pteridophytes flora and central area of China Pteridophytes flora. Tropical Asia species have some influence to the characteristics of species flora via spreading to northern regions.		
Preliminary analysis of climate characteristics and tourism climate of Fanjingshan	In order to improve the mountain tourism meteorological service ability, the data, of the temperature, precipitation, relative humidity, wind speed in 3 counties around Fanjingshan over the same period from 2012 to 2013 provided by Fanjingshan meteorological station, were compared. Based on this, the climatic characteristics of Fanjingshan and temperature humidity index and wind chill index were calculated, showing in summer, when it is unbearably hot around the town at the foot of the mountain, the temperature difference is big, the feeling is very comfortable, like the fire in the "oasis". In winter, the temperature decrease rate in relation to height is small, one can admire the ornamental charming scenery in the North, without feeling very cold. In spring and autumn, it is comfortable and slightly cold,	Xie Renbo, Mao Jiang, Bai Qinqin	*Journal of Guizhou Meteorology*, 2015,39(2): 34-36

	and perfect for hiking; Therefore, Fanjingshan is a good place for tourists throughout the year.		
Nature of seed rain, the seed bank and regeneration of a *Castanopsis Fargesii* community on Fanjingshan	Heavy seed rain is observed in the *Castanopsis fargesii* community of Fanjingshan with as much as 268.9 viable seeds per square meter. As the main species of the community all contribute to this seed rain, a foundation of regeneration in the community is ensured. The seed bank itself contains a large number of germinative seeds (3754.3 per square meter): these seeds belong to 18 woody species and 12 herb species. These species represent 13 extinct species vegetative present in the community and 17 species of earlier, serial species. The regenerative potential of the community can be described as good as all the main species of the community which have germinative seeds in the seed bank. These largely distribute in the litter layer, seeds of only 3 extant species emerged from soil samples. In contrast all of the germinative seeds of the earlier serial species were distributed in the soil. In the soil, the species diversity index of germinative seed declined gradually with increasing soil depth. The similarity between the seed bank and the present community similarly declined gradually from the litter layer down with depth into the soil. Under natural conditions, many germinative seeds of the main species of the present community in the seed bank germinate to contribute to the recruitment of seedlings. It is concluded that the present community regenerates well and is stable.	Liu Jiming, Zhong Zhangcheng	*Acta Phytoecolog ica Sinica*, 2000,24(4): 402-407
Ecological patterns in anatomic characters of	*Fagus lucida* L., distributing in Fanjingshan, Guizhou, China was used to explore ecological patterns in plant anatomy and their relationship with	Fang Jingyun, Fei Songlin, Fan	*Acta Botanica Sinica*, 2000,42(6): 636-642

leaves and woods of *Fagus lucida* and their climatic control in Fanjingshan, Guizhou, China	ecological factors, by applying climatic variables and multi -statistical analysis. As a result, with increasing temperature, all the anatomical characters of leaves, stomatal size of leaf surface, and vessel diameter and fiber length of woods showed a decreasing tendency, while stomatal density of leaves and vessel frequency and ray height of woods increased. As coldness index and moisture index increased, all the anatomic characteristics of leaf, stomatal size, and vessel length, and width and fiber length of wood displayed a sharp increase, whereas stomatal density, vessel frequency and ray height decreased. The stepwise regressive analysis showed that moisture variable is a limiting factor for controlling anatomic characters of leaves, and vessel frequency, vessel length and width, and fiber length of woods, precipitation for stomatal density, and temperature for stomatal size. No significant correlation of the ray frequency to climatic variables indicates that the ray frequency is a stable anatomical character.	Yongjun, etc.	
Reptiles resources in Fanjingshan National Nature Reserve	According to survey of reptile resources in Fanjingshan National Nature Reserve in the last thirty years, it has shown that in the reserve there are 43 reptile species belonging to 28 genera, 10 families, 3 suborders, 2 orders, accounting for 40.19% of the total number in Guizhou Province. Among them, *Zaocys nigromarginatus* and *Japalura szechwanensis* are new records to Fanjingshan National Nature Reserve. The 34 species of Oriental Realm both Central China and South China are dominant over other species in this fauna. A total of 43 reptile species in the reserve belongs to the species of terrestrial wildlife which are protected by China and are beneficial or	Zhang Lei, Ran Hui, Liang Li, etc.	*Journal of Tongren University*, 2011,13(4): 128-132

	have important economic and scientific research value. In these species, 13 species are included in China Red List of Endangered Animals, and 2 species listed on CITES Appendix II, 1 species is put into CITES Appendix III. Among the species, 3 species are dominant, 5 species are common, and other 35 are rare species. Considering the reserve condition and reptiles resource status, the endangered factors and protect suggestion for the reptile resources in the reserve are discussed.		

7. Documentation

7.a Photographs and audiovisual image inventory and authorization form

7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

7.c Form and date of most recent records or inventory of property

7.d Address where inventory, records and archives are held

7.e Bibliography

7. Documentation

7. a Photographs and audiovisual image inventory and authorization form

Fanjingshan World Natural Heritage Nomination Dossiers includes 10 materials as following:

(1) Nomination Text (2 Sets)

(2) Executive Summary (Appendix 1) (2 Sets)

(3) Maps in A0 size, (Appendix 2) (2 Sets (In rolled form))

(4) Management Plan (Appendix 3) (2 Sets)

(5) Atlas (Appendix 4) (2 Sets)

(6) Inventory (Appendix 5) (2 Sets)

(7) Slides (Appendix 6) (2 Sets)

(8)Video Disc (Appendix 7) (2 Sets)

(9) Authorization Form (Appendix 8) (2 Sets)

(10) Electronic Dossiers (Appendix 9), including ① Nomination Text, ② Executive Summary, ③Maps, ④Management Plan, ⑤Atlas, ⑥Inventory, ⑦Authorization Form with digital photos in JPG. (2 Sets (in USB flash disk and CD-ROM))

The text and attached electronic materials are placed in the CD and USB memory to submit. 2 sets of documents are put in 2 boxes and 2 map carrying columns with rolled maps inside. Photographs and audiovisual image inventory and authorization in shown in Table 7.1.

Table 7.1 Photographs and audiovisual image inventory and authorization form

No.	Format (Slide/ Print/ Video)	Caption	Date of Photo (mo/yr)	Photographer/ Director of the video	Copyright Owner (if Different than Photographer /Director of Video)	Contact Details of Copyright Owner (Name, address, tel: /fax, and e-mail)	Non Exclusive Cession of Rights
1	Digital photo	Geology, landforms, biology, ecology and natural beauty of the Fanjingshan Nominated Property	May 2004 to Jan 2017	Li Guiyun, Chen Hu, Zhou Wenqing, Yang Chuandong et al.	Office of the Leading Group for World Heritage Application of Tongren City	Name: Zhou Wenqing Address: No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China Post code 554300 Tel: +86-13985850306 Fax: +86-0856-8122180 E-mail: 23425444@qq.com	Use authorized

2	Slide	Geology, landforms, biology, ecology and natural beauty of the Fanjingshan Nominated Property	May 2004 to Dec. 2016	Li Guiyun, Chen Hu, Zhou Wenqing, Yang Chuandong et al.	Office of the Leading Group for Fanjingshan World Heritage Application of Tongren City	Name: Zhou Wenqing Address: No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China Post code 554300 Tel: +86-13985850306 Fax: +86-0856-8122180 E-mail: 23425444@qq.com	Use authorized
3	Video	Geology, landforms, biology, ecology and natural beauty of the Fanjingshan Nominated Property	May 2004 to Dec. 2016	Ministry of Housing and Urban-Rural Development of the People's Republic of China	Office of the Leading Group for Fanjingshan World Heritage Application of Tongren City	Name: Zhou Wenqing Address: No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China Post code 554300 Tel: +86-13985850306 Fax: +86-0856-8122180 E-mail: 23425444@qq.com	Use authorized

7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

7.b.1 Texts relating to protective designation

The nominated property of Fanjingshan has international protective status, national protective status and provincial national protective status. They are three types of designations, i.e. Network Member of the International Human and Biosphere Reserves, National Nature Reserve and Provincial Nature Reserve.

Network Member of the International Man and Biosphere Reserves: It is the new fashioned nature reserve that is established according to framework charter of "World Biosphere Reserve Network, and it is internationally recognized regions in the range of the UNSESO Man and the Biosphere Program, whose protecting means is that the traditional absolute protection will be turned into open, multi -functional active protection. It consists of two areas, including the central zone where the biological species are protected and the buffer zone in which the practical researches are carried out and the small projects are developed, such as vegetable planting, aquaculture, forestry development etc.

National Nature Reserve: National Nature Reserve is the natural concentrated distributing area of representative natural ecosystem and rare and endangered wildlife, and is the land, water and sea area of special natural values and deserving of special protection and administration. The Nature Reserve that has the typical significance in the domestic and international and has the important international influence or the special science research value in the science is listed National Nature Reserve.

National Non-Commercial Forest: key shelter forest or forest for special purpose which plays an important role in national ecological security, biodiversity conservation and sustainable development of economy and society with the main purpose of forest ecology and social service. It is usually the most significant natural habitat for in-situ conservation of biological diversity.

Provincial Nature Reserve: National Nature Reserve is the natural concentrated distributing area of representative natural ecosystem and rare and endangered wildlife, and is the land, water and sea area of special natural values and deserving of special protection and administration. In addition to the National Nature Reserve, the Nature Reserve that has other typical significance or significant scientific research value is listed local level nature reserve.

7.b.2 Copy of property management plan

The *Management Plan of the Nominated Fanjingshan World Nature Heritage nominated Properties (2016～2035)* has been prepared. It was approved by Office of the Leading Group for Fanjingshan World Heritage Application of Tongren City World Heritage Nomination in December 2016.

Brief explanation of the Management Plan see 5.e.2 .and a copy of the plan is submitted as Appendix 4.

7.b.3 Excerpt of relevant plans

The General Planning of Fanjingshan National Nature Reserve in Guizhou (2014～2023)

Chapter Five: the main contents of the plan are expounded. The protection area is improved for nature conservation and management, scientific research and monitoring, propaganda and education, community development and public relations, etc. and the content of extreme weather is added based on the implementation of the previous period overall planning.

From Chapter Six to Chapter Seven: The key engineering plans and management organization and capacity building plans are elaborated including protection management project, scientific research and monitoring projects, publicity and education projects, infrastructure and supporting projects, principles of management organization arrangement, management organization, the personnel system, tasks, functions and functions of organization, and proposed capacity building.

The General Planning of Ecological Tourism of Fanjingshan National Nature Reserve (2014～2023)

Chapter Five: The general plan layout, elaborates that the tourism service area, tourist attractions, landscape ecological conservation area are zoned and controlled according to the zoning principles of overall planning function zoning, sustainable development, adjusting measures to local conditions and convenient construction management as well as the zoning characteristics of overall consideration, adjusting measures to local conditions, conservation buffer zone, coordinated control. Fanjingshan ecological tourism area will be divided into a special tourism, passenger transport cableway and pedestrian area and ecological tourism land use will be went on status analyzing and planning in accordance with the structure layout of a core, two belts, multi point and different travel modes.

Chapter Twelve: The environmental impact assessment and protective measures are expounded. The traditional location and tracking monitoring adopt are adopted to monitor the ecological environment and monitor tourists through equipping with "mobile detector" and two-way intercom system. The environment is evaluated from positive and negative effects. The measures are proposed, including environmental capacity control, ecological resources protection, ecological environment protection, tourism resources protection, ecological environment education and key construction projects environmental protection.

The Conservation Plan of "The only child in the world" Guizhou Golden Monkey (2015～2025)

Chapter Four: The ten years protection plan of Guizhou Golden Monkey whose protective measures include routine protection, personnel training, protection and education, scientific research and community coordination is proposed, which is elaborated from their purpose and significance.

The Master Plan of the Yinjiang Yangxi Provincial Nature Reserve in Guizhou (2015～2024)

Chapter Five: The Planning content of Yangxi provincial nature reserve in Yinjiang, including protection and management planning, scientific research and monitoring planning, publicity and education planning, infrastructure construction planning, common management of community planning, ecological tourism planning and multiple business planning, are elaborated. The detailed protection and management planning is developed for wild animals and plants protection, forest fire prevention, pest control, ecological restoration, comprehensive management of social security of protective areas and ecological migration, and specific protective measures are putted forward.

7.c Form and date of most recent records or inventory of property

Table 7.2 Form and date of the latest records in Fanjingshan

Nominated Property	Records	Date	Form
Fanjingshan	List of Higher Plants in Fanjingshan	2016	Investigation report
	List of Vertebrate Animals in Fanjingshan	2016	Investigation report
	List of Invertebrate Animals in Fanjingshan	2016	Investigation report
	Evaluation Report and Comprehensive Research on Geomorphological and Geological Relics of world natural nominated property of Fanjingshan	2015	Investigation report
	Evaluation Report and Comprehensive Research on Scenic Landscape of world natural nominated property of Fanjingshan	2015	Investigation report
	List of Rare and Endangered Wild Plants of world natural nominated property of Fanjingshan	2015	Investigation report
	List of Rare and Endangered Wild animals of world natural nominated property of Fanjingshan	2015	Investigation report
	List of Endemic Plants of world natural nominated property of Fanjingshan	2015	Investigation report
	List of Endemic Animals of world natural nominated property of Fanjingshan	2015	Investigation report
	List of Bryophyte of world natural nominated property of Fanjingshan	2015	Investigation report
	Evaluation Report and Comprehensive Research on Humanistic Relics of world natural nominated property of Fanjingshan	2015	Investigation report
	Study on Quaternary Glaciers Geology of Fanjingshan	2013	Journal
	Trace Element Characteristics and Sedimentary Environment of the Sinian system of the Fanjingshan Area in Guizhou Province	2008	Journal
	The Late-Proterozoic magmatic and tectonic implications, the Fanjingshan Mt., Northeast Guizhou Province	2012	Dissertation
	Quantitative reconstruction of vegetation and climate of Fanjingshan section in Guizhou during last 1,0000 years	1992	Journal
	The changes of vegetation and climate of Jiulongchi section of Fanjingshan mountain in Guizhou since 1,0000 years age	1986	Journal
	Structure and Dynamic Characteristics of a Wild Population of Endangered *Abies fanjingshanensis*	2011	Journal
	Primary investigation and conservation strategy of medicinal Plant Species in Fanjing Mountain	2013	Journal
	Study on Fern Flora and Vertical Distribution Pattern of Guizhou Fanjingshan National Nature Reserve	2008	Dissertation
	Life Table Survival Analysis of Natural *Davidia involucrate* Population in Fanjing Mountain Nature Reserve, Guizhou Province of Southwest China	2012	Journal
	Distribution of *Taxus chinensis* var. *mairer* Resource in Fanjingshan Natural Reserve	2009	Journal
	A List of The Orchid Plants in Fanjing Mountain National Nature Reserve, Guizhou, China	2007	Journal
	The Studies on Flora and Ecological Features of Liana in Fanjing Mountain National Nature Reserve, Guizhou, China—Attach a List of Liana in the Fanjing Mountain.	2001	Journal

	Anatomical Characteristics of Leaves and Woods of *Fagus lucida* and Their Relationship to Ecological Factors in Mountain Fanjingshan, Guizhou, China	1999	Journal
	The Component and Appraisement of Macrofungi of Fanjingshan, Guizhou Province, China	2014	Journal
	Vegetation Distribution in Fanjing Mountain National Nature Reserve and Habitat Selection of Guizhou Gold Monkey	2010	Journal
	Reptiles Resources in Fanjing Mountain National Nature Reserve	2011	Journal
	An Probe into the Protection of Buddhist Culture and Ecology in Fanjing Mountain	2014	Journal
	Study on Maitreya Culture of Fanjingshan	2015	Journal
	An Probe into Miao customs of Fanjingshan	2004	Journal
	National Culture and Eco-Preservation—A Case Study of Protecting Forest Stones in Fanjingshan Mountain of Tongren	2011	Journal

Table 7.3 Form of inventory in Fanjingshan

Nominated	Form of Inventory of Property
Fanjingshan	Inventory of Aesthetic Landscapes in Fanjingshan
	Inventory of Rare and Endangered Plants in Fanjingshan
	Inventory of Rare and Endangered Animals in Fanjingshan
	Inventory of Endemic Plants to Fanjingshan
	Inventory of Endemic Animals to Fanjingshan
	Inventory of Type Specimen Plans to Fanjingshan

7.d Address where inventory, records and archives are held

Table 7.4 Address where inventory, records and archives are held

Nominated Property	Name	Address	Postcode
Fanjingshan	Department of Housing and Urban-Rural Development of Guizhou Province	No. 2, West Yan'an Road, Guiyang, Guizhou Province, China	550001
	Guizhou Normal University	No. 116, North Baoshan Road, Guizhou Province	550001
	Office of the Leading Group for Fanjingshan World Heritage Application of Tongren City	No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China	554300
	Administration of Guizhou Fanjingshan National Nature Reserve	No. 17 West Sanxing Road, Shuangjiang Town, Jiangkou County, Tongren City, Guizhou Province, China	554400
	Administration of Guizhou Yinjiang Yangxi Provincial Nature Reserve	No.313 Fanjingshan Road, Eling Street Office, Yinjiang County, Tongren City Guizhou Province, China	555200

7.e Bibliography

[1] An Mingtai, Yu Lifei, Zhang Huahai, et al. 2013. Comparison Analysis of seed plant flora in Fodingshan Nature Reserve, Fanjingshan Nature Reserve and Leigongshan Nature Reserve[A]. Chinese Association for science and technology, the people's Government of Guizhou Province. The fifteenth Chinese Association annual meeting nineteenth branch field: the Conference Symposium of China western ecological forestry and the livelihood of forestry and Technology Innovation[C]. Chinese Association for science and technology, the people's Government of Guizhou Province, pp. 7.

[2] Bai Shouchang, Zou Shuquan, Lin su, et al. 1988. An investigation of distribution, number and food habit of the *Rhinopithecus bieti* [J]. *Zoological Research*, 9(1):67-75.

[3] Bleisch W V, Cheng A S, Ren X D, et al. 1993. Preliminary results from a field study of wild Guizhou Snub-nosed Monkeys (*Rhinopithecus brelichi*)[J]. *Folia Primatologica*, 60(1/2): 72-82.

[4] Bleisch W V, Xie Jiahua. 1998. Ecology and behavior of the Guizhou Snub-nosed Langur (*Rhinopithecus brelichi*), with a discussion of the socio-ecology in the genus [M]. Jablonski N G. The Natural History of the Doucs and Sub-nosed Monkeys Singapore: World Scientific Publishing, pp. 217-339.

[5] Boonratana R., Le X.C. 1998. In: Nina G Jablonski(ed)[Z]. The Natural History of the Doucs and Snub-nosed Monkeys, pp. 207.

[6] Cao Chunhua, Cheng Ningsheng, Wang Peiji, et al. 1988. The chemical constituents of the essential oil from the roots of Vaeriana Officinalis L [J]. *Journal of Guizhou Normal University (Natural Sciences)*, (2): 10-13.

[7] Cao Tieru, Qi Chengjin, Yu Xunlin. 1997. Studies on species diversity of *Fagus lucida* communities on the Badagongshan Mountain, Hunan [J]. *Chinese Biodiversity*, 5(2): 112-120.

[8] Chang Hongxiu. 1989. A Survey on the bryophytes from the Jinggang Mountain in Jiangxi [J]. *Journal of Jiangxi University (Natural Science)*, 13(1): 62 - 71.

[9] Chen Baoming, Lin Zhenguang, Lizhen, et al. 2012. Ecosystem diversity in Jingangshan Area , China[J]. *Acta Ecologica Sinica*, 32(20):6326-6333.

[10] Chen Chengyan, Mike·Crossby, Su Yixiong, et al. 2009. The natural habitat in

China- Key bird area[M]. BirdLife International, pp.134-136.

[11] Chen Gongxi, Li Qing, Chen Jun, et al. 2001. A preliminary study on the community environment of Dolichomitriopsis diversiformis (Mitt.) Nog. in Mt. Fanjing, Guizhou, China[J]. *Guizhou Science*, 19(4):81-84.

[12] Chen H., Wen X. 1999. A new species of Simulium from Fanjing Mountain, Guizhou Province,China (diptera:simuliidae)[J]. *Acta Zootaxonomica Sinica*, 24(4): 78-81.

[13] Chen Hanbin, Zhang Chunlin. 1997. Two new species of Eusimulium from Guizhou Province, China [J]. *Acta Zootaxonomica Sinica*, 22(3): 301-306.

[14] Chen Jian. 2014. Report of investigation on *Fagus* of Micangshan Nature Reserve [J]. *Chinese Wild Plant Resource*, 33(2):47-52

[15] Chen Jing, Li Lizhen, Zhao Meijun. 2005. A New species of the genus lathrobium (coleoptera, staphylinidae) from Guizhou Province southwest, China [J]. *Acta Zootaxonomica Sinica*, 30(3): 598-600.

[16] Chen Linzhi. 1993. The status quo of China's biodiversity and its protective measures [M]. Beijing: Science Press.

[17] Chen peiying.1990. Research on Fanjingshan: The quaternary pollen combination and ancient environment in nature reserve of Mount Fanjing [M]. Guiyang: Guizhou people press, pp.376-385.

[18] Chen Qing, Wang Mali, Zhang Manxiang. 2008. Preliminary study of flora of Hepaticae of Qinling Mountain [J]. *Journal of Wuhan Botanical Research*, 26(4):366-372.

[19] Chen Yixin, Xiang Zuofu. 2015. The new of primates Rhinopithecus strykeri found in Nu River [J]. *Journal of Forest and human*, (3):92-95.

[20] Cheng Xiangsheng, Yang Lin. 2008. A new species of genus Rhotala (Hemiptera, Fulgoroidea, achilidae) in Fanjingshan, Guizhou [J]. *Acta Zootaxonomica Sinica*, 33(02): 372-375.

[21] Chen Muhong, Xiao Puzhong. The origins and contemporary thinking of Buddhism in Fanjingshan [J]. *Journal of Career Technical College in Tongren*, 2001, 9(4):1-5, 23.

[22] China Forest Editorial Council. 1997. China forest, Volume first [M]. Beijing:

China Forestry Publishing House.

[23] China Forest Editorial Council. 2000. China forest, Volume third [M]. Beijing: China Forestry Publishing House.

[24] Christoph Dittmar, Wolfgang Fricke, Wolfram Elling. 2006. Impact of late frost events on radial growth of common beech (*Fagus sylvatica*) in Southern Germany [J]. *Eur J Forest Res*, 125(3): 249–259.

[25] Convention on International Trade in Endangered Species of Wild Fauna and Flora [DB/OL]. 2014. http://www.cites.org/.

[26] Convention on International Trade in Endangered Species of Wild Fauna and Flora [EB/OL]. http://www.cites.org/ .2010.

[27] Cui Duoying, Niu Kefeng, Chia L.Tan, et al. 2014. Guizhou Snub-nosed Monkey (*Rhinopithecus brelichi*) in Mt. Fanjingshan, Guizhou Province, China [J]. *Chinese Journal of Zoology*, 49(5):792.

[28] Cui W, Li Z, Yang D. 2009. New species of Allognasta from Guizhou (Diptera, Stratiomyidae)[J]. *Acta Zootaxonomica Sinica*, (4):795-797.

[29] Cui Y, Xue W. 2001. Two new species of the genus Coenosia (Diptera: muscidae) from Mt. Fanjing of Guizhou, China [J]. *Entomologia Sinica*, 8(3): 203-207.

[30] Dai Chuangu. Geologic character and tectonic evolution of the east Guizhou and its adjacent region [D]. *China University of Geosciences (Beijing)*, 2010.

[31] Dai Xun, Wang Lei, Yang Shunqiang, et al. 2011. Investigation on the status Quo and characteristics of forest resources in Sanjiangkou natural research of Yunnan Daguan[J]. *Journal of Anhui Agri Sci*, 39(5):2769-2771, 2869.

[32] Denk T. The taxonomy of *Fagus*, in western Eurasia, 1: Fagus sylvatica, subsp. orientalis, (= *F. orientalis*) [J]. Feddes Repertorium, 1999, 110(3-4):177-200.

[33] Deng Fenglin. 1986. Surey of the geology and geochemical background values of the Fanjingshan Mountain area. Scientific survey of the Fanjingshan Mountain Preserve, Guizhou Province, China [M]. Beijing: China Environmental Science Press, pp. 13-43.

[34] Deng Hanzhong. 2014. Study on distribution of vegetation in Fanjing Mountain based on RS-GIS [J]. *Journal of Guizhou Normal University (Natural Sciences)*, 32(5):32-37.

[35] Deng Lilan, Yang Chuandong. 1991. The pteridophyte flora of Fanjingshan Mountain [J]. *Guihaia*, 11(1):44-50.

[36] Deng Lunxiu, Pan Dequan. 2006. Research of the wild Aceraceae plants resources and ornamental characteristics in Guizhou [J]. *Forest By-Product and Speciality in China*, (4): 84-88.

[37] Department of wild animal protection of state forestry administration. 2002. Community co-management of nature reserve [M]. Beijing: China Forestry Press, 3.

[38] Design Institute of Forest Products Industry, District Administration of Guizhou Fanjingshan National Nature Reserve. 2013. District Planning of Guizhou Fanjingshan National Nature Reserve (2014~2023) [Z].

[39] Du Yuzhou. 2000. Two new species of the genus Neoperla Needham (Plecoptera: Perlidae: Perlinae) from Guizhou, China [J]. *Acta Zootaxonomica Sinica*, 22(1): 1-5.

[40] Editorial Committee of Chinese Journal of Plant Science, Chinese Academy of Sciences, 1990, Chinese Journal of Plant Science [M]. China Science Press.

[41] Editorial Council of Vegetation in China. 1980. The Vegetation in China [M]. Beijing: Science Press.

[42] Eudey A.A. 1987. Action Plan for Asian Primate Conservation: 1986-1991[Z]. IUCN/SSC Primate Specialist Group.

[43] Fan Fusheng. 1993. Zhejiang forest [M]. Beijing: China Forestry Publishing House.

[44] Fan Jingquan. 2006. Chinese *Abies* Forest [M]. Beijing: China Forestry Press, 12-28.

[45] Fan Junde, Xu Qinzhi, Shen Zhengxiong, et al. 2011. The protection and research of the status quo of Vibrissaphora boringii[J]. *jilin agriculture*, (7):246.

[46] Fang Jingyun, Fei Songlin, Fan Yongjun, etc. 2000. Ecological patterns in anatomic characters of leaves and woods of *Fagus lucida* and their climatic control in Mountain Fanjingshan, Guizhou, China[J]. *Acta Botanica Sinica*, 42(6):636-642.

[47] Fang Jinyun, Wang Zhiheng, Tang Zhiyao. 2010. The distribution of woody plants

Chinese Atlas [M]. Beijing: Higher Education Press.

[48] Fanjingshan National Nature Reserve Administration. 2004. The Management Plan of Guizhou Fanjingshan National Nature Reserve.Jiangkou, Fanjingshan National Nature Reserve Administration, pp. 11-16.

[49] Fanjingshan tourism information website [DB/OL]. http://www.gzfjs.gov.cn/.

[50] Gao Guilong, Deng Zimin, Xiong Kangning, et al. 2003. Call and hope of Karst: the eco-environment construction and sustainable development in Guizhou Karst area[M]. Guiyang: Guizhou Science and Technology Press, pp. 22-26.

[51] Gao Jianqiang, Zheng Yanfei, Shu Hua, et al. 2011. Investigation of the edible wild plant species in Mt. Fanjingshan and its adjacent areas [J]. *Journal of Anhui Agricultural Sciences*, 39(36): 22549-22555.

[52] Gao Jianqiang, Zheng Yanfei, Shu Hua, et al. 2012. The research of the situation and strategy of conservation and utilization to the edible wild plant species in Fanjing Mountain and its adjacent areas[J]. *Journal of Huaihua University*, 31(2): 32-36.

[53] Gao Linzhi, Chen Jianshu, Dai Chuangu, et al. SHRIMP zircon U-Pb dating of tuff in Fanjingshan Group and Xiajiang Group from Guizhou and Hunan Provinces and its stratigraphic implications [J]. *Geological Bulletin of China*, 2014, 33(7): 949-959

[54] Geissmann T, Lwin N, Aung S S, et al. 2011. A New species of Snub-nosed monkey, genus Rhinopithecus Milne-Edwards, 1872(Primates, Colobinae), from Northern Kachin State, Northeastern Myanmar [J]. *American Journal of Primatology*, 73 (1): 96-107.

[55] Gong Shuangjiao, Chen Gongxi. 2006. The rare and endangered plants in Wulingshan region and its conservation and utilization [J]. *Guihaia*, 26(3): 242-248.

[56] Gong Zixian. 2006. Developing study of eco-tourism in Emeishan World Heritage [D]. Chengdu: Chengdu University of Technology, 13-18.

[57] Gu Jiaofeng. 2005, The Resource of Tragopan temminckii and the Analysis of Habitat in Mon. Badagongshna [D]. Changsha: Central South Forestry University, 15-17.

[58] Gu Yonghe, Luorong .1990. Research on Fanjingshan: The Beasts in nature reserve of Mount Fanjing [M]. GuiYang: Guizhou People Press, pp. 376-385.

[59] Gu Yonghe, Xu Longhui. 1998. *Muntiacus Reevesi jiangkouensis*—A new subspecies from Guizhou, China (Artiodactyla: Cervidae)[J]. *Acta Zoologica Sinica*, 03:17-23.

[60] Guizhou Bureau of Geology and Mineral Resources. 1987. Regional geology of Guizhou Province [M]. Beijing: Geological Publishing House, pp. 617-638.

[61] Guizhou Fanjingshan National Nature Reserve Administration. 2004. The Management Plan of Guizhou Fanjingshan National Nature Reserve [Z]. Jiangkou, Guizhou Fanjingshan National Nature Reserve Administration, pp. 1-18.

[62] Guizhou Fanjingshan National Nature Reserve Administration. 2013. The Text of Guizhou Fanjingshan National Reserve Declaring World Natural Heritage [Z]. Tongren, Guizhou Fanjingshan National Nature Reserve Administration, pp. 58-67.

[63] Guizhou Fanjingshan National Nature Reserve Administration. 2013. Guizhou Fanjingshan National Nature Reserve Master Plan (2014-2023) [Z]. Jiangkou, Guizhou Fanjingshan National Nature Reserve Administration.

[64] Guizhou Normal University. 2013. South China Karst Phase Ⅱ management plan[Z]. GuiYang, Guizhou Normal University, pp. 66-78.

[65] Guo Jing. 2010. Analysis on Structural Characteristics in the Micangshan Area, NW Sichuan Basin [D]. Hangzhou: Zhejiang University, 11-15.

[66] GuoYanqing, ZhouJun, SongXianhua, DwngHuaqing. 2017.The Population of *Rhinopithecus brelichii* in Fanjingshan National Nature Reserve, Guizhou, China [J]. Acta Theriologica Sinica. 37(1): 123-128.

[67] Guo Ziye. 2007. Study on the Protection of the Fanjingshan Nature Reserve and the Development of its Ambient Communities [D]. Guiyang: Guizhou Normal University.

[68] He Changrui, Chen Fangqing. 1997. The analysis of Chinese endemic genera of the Spermatophytes in Shennongjia [J]. *Guihaia*, 17(4): 317-320.

[69] He Junhua. Chen Xuexin, Ma Yun. 2005. Two new species of the genus

Ropronia Provancher (Hymenoptera: Roproniidae) from China [J]. *Entomotaxonomia*, 27(3): 220-226.

[70] He Lixian, Han Zhijun, Wang Yangeng. 1990. The formation of Fanjingshan Mountain and its relationship with natural environment. Research of Fanjingshan Mountain [M]. Guiyang: Guizhou People's Publishing House, pp. 1-6.

[71] He Shunzhi. 1995. Additions in the species and distribution of Ranunculaceae in Guizhou (I)[J]. *Guizhou Science*, 13(1): 29-34.

[72] He Shunzhi. 1995. Additions in the species and distribution of Ranunculaceae in Guizhou(II)[J]. *Guizhou Science*, 13(2): 49-54.

[73] He Shunzhi. 1995. Medicinal plant resources of Ranunculaceae in Guizhou[J]. *Journal of Chinese Medicinal*, 18(6): 280-283.

[74] Hong Bigong, An Shuqing. 1993. Preliminary studies on the geographic distribution of *Fagus* in China [J]. *Acta Bonitica Sinica*, 35(3):229-233.

[75] Hou Yong, Wang Guiqing, Zhangping. 2000. Study on the shrub vegetation in Tuoliang Mountainous Region in Fuping County [J]. *Hebei Journal of Forestry and Orchard Research*, 15(4):318-324.

[76] Hu Jiayao, Li Lizhen, Zhao Meijun. 2005. A New species of the genus Nazerjis from Guizhou, China (coleoptera, staphylinidae, paederinae)[J]. *Acta zootaxonomica sinica*, 30(1): 95-97.

[77] Hu Shuqin, Zhao Ermi, Liu Chengzhao. 1973. A Survey of amphibians and reptiles in Guizhou Province, including a herpetofaunal analysis [J]. *Current Zoology*, 19(2): 149-181.

[78] Hu Xiaoyun, Wu Pengcheng. 1991. Study on Jinfoshan Moss Flora [J]. *Acta Phytotaxonomica Sinica*, (4).

[79] Hua Bo, Ma Jianlun, Deng Hongping, et al. 2010. Floristic analysis of seed plants in Chishui Alsophila National Nature Reserve[J]. *Journal of Southwest China Normal University (Natural Science Edition)*, 35(5): 167-172.

[80] Huang Caijiang. 1989. The vertical distribution of the ferns in Fanjingshan, Guizhou [J]. *Journal of Guizhou Normal University (Natural Sciences)*, (1): 52-62.

[81] Huang Chenglin, Wu Zeming, Chen Xiaohong. 1995. Study on major plant community types and successional rules of *Pinus taiwanensis* community in M t.

Huangshan, China [J]. *Journal of Anhui Agriculture University*, 26(4): 388-393.

[82] Huang William, Tu Yulin, Yang Long. 1988. Guizhou Vegetation [M]. Guiyang: Guizhou People Press.

[83] Huang Xiaozhu, Yanyi, Luo Yifan, et al. 2009. The present situation and protection of biodiversity in Leigongshan Nature Reserve [J]. *Decision Management*, (26): 79-80.

[84] Hubei Shennongjia national nature reserve administration. Shennongjia, China [DB/OL]. http://www.snjbhq.com/.

[85] Institute of Biological research, Guizhou Academy of Sciences. 1988. Guizhou plant annals [M]. Guiyang: Guizhou Science and Technology Publishing House.

[86] IUCN. 2010. IUCN Evaluation Report: World Heritage Nomination-IUCN Technical Evaluation Three Parallel Rivers of YUNNAN Protected Areas (CHINA) [R].

[87] Jablonski N G& Pan Yuering. 1988. The evolution and palaeo-biogeography of Monkeys in China. The Palaeo-environment of East Asia from the Mind-Tertiary VII:449-467 Centre of Asian Studies, University of Hong Kong.

[88] Jia Yili, Wang Xiangfu, Qi Daihua, et al. 2009. A Composition analysis of seed plant flora in Yintiaoling Nature Reserve [J]. *Hebei Journal of Forestry and Orchard Research*, 4(24): 371-375.

[89] Jiang Jigang, Wei Meicai, Zhu Xun. 2004. Two new species of Pamphiliidae from China (Hymenoptera： Pamphiliidae)[J]. *Journal of Central South University of Forestry & Technology (Social Sciences)*, 24(2): 44-46.

[90] Jiang Rubi. 1993. The plant specimens name list of the dendrological herbarium in Guizhou Forestry Academy [J]. *Guizhou Forestry Science and Technology*, 21(2): 1-97.

[91] Jiang Yang. 2004. Study on the diversity of insect species in Hupingshan National Nature Reserve [D]. Changsha: Central South Forestry University.

[92] Jiao Hengsheng, Zhong Zhiyu, Cheng Lin, et al. 2009. Vertical rule of woody plants diversity of forest communities in Wuyishan Nature Reserve of Jiangxi[J]. *Jiangxi Forestry Science and Technology*, (1): 6-10.

[93] Jin Xiaofeng, Ding Bingyang, Zheng Chaozong, et al. 2004. The floristic analysis

of seed plants in Baishanzu Nature Reserve from Zhejiang Province [J]. *Acta Botanica Yunnanica*, 26(6):605-618.

[94] Kong Zhaochen, Tu Naiqiu, Xi Yizhen, et al. 1976. Vegetational and climatic changes in Peking during the Pastone Hundred Million Years[J].*Acta PhytotaxSin*, 14(1):78-89.

[95] Kremp GOW. 1967. Catalog of fossil spores and pollen vol. 26[M]. Penn: The Pennsylvania State University, 115.

[96] Kuang Denghui, Li Houhun. 2009. One new species and three new records species of the genus dioryctria zeller in China (lepidoptera, pyraiidae, phycitinae) [J]. *Acta zootaxonomica sinica*, 34(1): 42-45.

[97] Lan Sireng. 2003. Plant species diversity in Wuyishan National Nature Reserve [J]. *Scientia Silvae Sinicae*, 1(39): 37-43.

[98] Li Changgu. 1990. The nature vertical zones on the east slope of MT. Emei in Sichuan Procvince [J], *Mountain Research,* 8 (1)39-44.

[99] Li Guanghua. 1994. Rare and endangered medicinal plants in Fanjing Mountain.China [J]. *Journal of Chinese Materia Medica*, 19(11): 651-652.

[100] Li Jianqiang, Wang Hengchang, Li Xiaodong, et al. 2003 . Molecular phylogenetic inference in *Fagus*(Fagaceae)based on ITS(Intemal Transcribed Spacer)sequence of nuclear ribosomal DNA[J] . *Journal of Wuhan Botanical Research* (21):31-36.

[101] Li Jianxin, Jiang Daiqing, Wu Dingjun, et al. 2013. Prospect of Plants Landscape Resources and gardens Application in Fanjingshan National Nature Reserve[J]. *Hubei Agricultural Sciences*, 52(16): 3889-3894.

[102] Li Jianxin, Wu Dingjun, Gao Jianqiang, et al. 2013. The investigation of plants landscape resources in Fanjingshan National Nature Reserve [J]. *Agriculture and Technology*, 33(8):139-140.

[103] Li Kun. 2012. Research on Ecological Compensation Mechanism of Fujian Wuyi Mountain National Nature Reserve [D]. Fuzhou: Fujian Normal University.

[104] Li Mao, Deng Lunxiu, Pan Dequan, et al. 2011. Studies on zenia insignis community in Fanjingshan National Nature Reserve[J]. *Journal of Zhejiang Forestry Science and Technology*, 31(5):6-9.

[105] Li Ming, Zhao Jiancheng, Wang Li Bao. 2004. A preliminary study on bryophytes of Xiaowutai Mountain Nature Reserve, Hebei Province, China [J].*Geography and Geo-Information Science*, 20(2):109-112.

[106] Li Ping, Zhang Huahai. 2012. New records I of seed plant in Guiyang City [J]. Seed, 31(4):62-64.

[107] Li Qiang, He Junhua. 1999. A new species of Spilomena Shuckard from Guizhou (Hymenoptera：Sphecidae)[J]. *Acta Zootaxonomica Sinica*, 24(1): 90-92.

[108] Li Shugang. 1983. Materiae ad Floram Ebenacearum Sinensium [J]. *Guihaia*, 1983, 3(4):285-290.

[109] Li Xianwen. 2007. Insect resource investigation and analysis of community structure in HuPingshan National Nature Reserve[D]. Changsha: Hunan Agricultural University.

[110] Li Xiaona, Long Mingzhong, Liu Yang, et al. 2014. Bryoflora characteristics of Shibing Karst World Natural Heritage Nominated Property in Guizhou[J]. *Journal of Plant Taxonomy and Resources*, 36(3):271-278.

[111] Li Xiaoxiao, Wang Qingchun, Cui Guofa, et al. 2011. Structure and dynamic characteristics of a wild population of endangered *Abies fanjingshanensis*[J]. *Acta Botanica Boreali-Occidentali Sinica*, 31(7): 1479-1486.

[112] Li Xiaoxiao. 2013. Ecological study on endangered mechanism of five *Abies* species in China[D]. Beijing: Beijing Forestry University, 15-17.

[113] Li Xiaoxiao, Wang Qingchun, Cui Guofa, etc. 2011. Structure and dynamic characteristics of a wild population of endangered *Abies fanjingshanensis*. Acta Botanica Boreale-Occidentalia Sinica,31(7):1479 -1486.

[114] Li Xingzhong, Wang Liting, Liu Jiaren, et al. Study on Quaternary Glaciers Geology of Fanjing Mountain [J]. *Guizhou Geology*, 2013, 30(3): 203-212.

[115] Li Z, Zhang T, Yang D. 2009. Two new species of actina from china (diptera, stratiomyidae)[J]. *Acta Zootaxonomica Sinica*, 34(4): 798-800.

[116] Li Zhixiang, Ma Laishi, Hua Chenghui, et al. 1981. The distribution and habit on Yunnan Snub-nose Monkey[J]. *Zoological Research*, 2(1): 9-16.

[117] Li Zizhong. 1988. Three new species of Fanjingshan Mountainous leafhoppers from Guizhou, China [J]. *Guizhou Scienc*e, (S1): 87-91.

[118] Li Zizhong. 2006. Insects of Fanjing Mountain [M]. Guiyang: Guizhou Science & Technic Press.

[119] Li Zhennan, Jin Yansong, Yang Jianqing. Conservation and utilization adivices of the bird rescource in the Yangdang Mountains [J]. *Chinese Wildlife*, 26(5)55-56.

[120] Liao Wen, Zuo Jinghui. 2008. Study on flora of medicinal seed plants in Fanjing Mountain National Nature Reserve, Guizhou, China [J]. *Journal of Anhui Agricultural Sciences*, 36(34):15038-15042.

[121] Liu Bing, Jiang Yefang, Li Qiing, etc. 2006. A Study on distribution pattern of an epiphytic bryophyte, dolichomitriopsis diversiformis (Lembophyllaceae) on tree trunks in forest in Fanjing Mountain of Guizhou [J]. *Acta Botanica Yunnanica*, 28(2)169-174.

[122] Lin Jinxing, Li zhengli. The changes of fagaceae plant classification system and contention [M]. Harbin: The northeast forestry university press, 1992.

[123] Liu Chengzhao, Hu Shuqin, Fei Liang. 1979. Five new pelobatid toads from China [J]. *Acta Zootaxonomica Sinica*, 4(1): 83-92,101-102.

[124] Liu D.B., Liang Y.J, Wen Y.F, Zhang F.Q, 2013, Flourishing azaleas, beautiful Fanjingshan-Azalea silhouette in Yinjiang Fanjingshan, Guizhou, China, 2013[J]. Contemporary Guizhou, (11):5-6.

[125] Liu Fengting. 1981. Climbing Fanjingshan to visit rare plants [J]. *Environmental Protection and Technology*, (2): 40.

[126] Liu Guozhu. 1976. Several kinds of special trees in Fanjingshan [J]. *Guizhou Forestry Science and Technology*, (3):43-44.

[127] Liu Jiming. 1999. Preliminary study on the seed rain and seed bank of the mixed evergreen and deciduous broad-leaved forest on Fanjing Mountain [J]. *Journal of South China Agricultural University*, 20(2): 60-64.

[128] Liu Jiming, Zhong Zhangcheng. 2000. Nature of seed rain, the seed bank and regeneration of a *Castanopsis Fargesii* community on Fanjing Mountain [J]. *Acta Phytoecolog ica Sinica*, 24(4)402-407.

[129] Liu Mingzhi, Xie Guangxin, Yao Peng, et al. 2010. Investigation and application of domestic garden plants in Fanjingshan Mountain[J]. *Guangdong Landscape*

Architecture, 32(5): 56-59.

[130] Liu Mingzhi, Yao Peng, Li Muliang, et al. 2009. Utilization of the domestic garden plant resource in Fanjingshan Mountain[J]. *Guizhou Agricultural Sciences*, 37(8): 169-171.

[131] Liu Shengxiang, Tian Chunyuan, Wu Jinqing, et al. 1999. Studies on the bryophyta plants resources in Hubei, China I species and distribution of bryophyta in M t. Shennongjia [J]. *Journal of Huazhong Normal University (Natural Science Edition)*, (3): 420-434.

[132] Liu T S. 1971. A monography of the genus *Abies* [M]. Department of Forestry College of Agriculture National Taiwan University, Taipei, Taiwan, China.

[133] Liu Yi, Xu Cong, He Shunzhi. 1997. Addendum of the medicinal plants in Guizhou [J]. *Journal of Chinese Medicinal Materials*, 20(9): 444-447.

[134] Liuenyuan, Daiqilai. Fanjingshan, a shrine of ancient Buddha[J].*The world of literature and history about Guizhou*, 1999, (3):38-41

[135] Lu Zhijun, Bao Dachuan, Guo Qili, et al. 2013. Community composition an structure of Badagognhan forest dynamic plot in a mid-subtropical mountain evergreen deciduous broad-leaved mixed forest central China[J]. *Journal of Plant Science*, 31(4): 336-344.

[136] Luo Qinghuai. 1997. A new species of Aridelus Marshall (hymenoptera: braconidae: euphorinae) from China [J]. *Entomotaxonomia*, 19(1): 57-59.

[137] Ma Jungai. 2006. The preliminary study on the liverworts of Xingdoushan National Nature Reserve, Hubei Province [D]. Wuhan: Central China Normal University.

[138] Ma Yonghong, He Xingjin. 2007. Flora of seed plants in Wolong Nature Reserve [J]. *Journal of Tropical and Subtropical Botany*, 15(1): 63-70.

[139] Meng Fanhua. 2006. Study on diversity and conservation of the flora of Yunbaoshan Nature Reserve, Guangxi, China [D]. Guilin: Guangxi Normal University.

[140] Meng Hongxia, Rong Li, Chen Hu, et al. 2011. Seed plant flora in Chishui Danxia Natural World Heritage Sit [J]. *Journal of Guizhou Normal University (Natural Sciences)*, 29(2): 12-15.

[141] Nie Shuaiguo, Xiang Zuofu, Li Ming. 2009. Preliminary report on the diet and social structure of gray Snub-Nosed monkeys (*Rhinopithecus brelichi)* at Yangaoping, Guizhou, China[J]. *Acta Theriologica Sinica*, 29(3): 326-331.

[142] Niu Kefeng, Yang Yeqin. 2012. Megophrys brachykolos was found in Guizhou Province [J]. *Chinese Journal of Zoology*, 47(6): 119-120.

[143] Pan Jinglu. 2013. The study on impact of development to Qinling biodiversity conservation based on the pressure of habitat [D]. Beijing: Beijing Forestry University.

[144] Pei Linying. 2006. The study on the Bryoflora of Mt. Emei [D]. Jinan: Shandong Normal University.

[145] Peng Lifang, Li Xingui. 2010. Effects of ring road construction on biodiversity in Fanjing Mountain Nature Reserve [J]. *Forest Inventory and Planning*, (6): 53- 58.

[146] Peters R. Beech Forests [M]. Springer Netherlands, 1997, ix, 3-7.

[147] Pham N. 1994. Some data on the food of the Tonkin snub-nosed monkey (*Rhinopithecus avunculus*) [J].*Asia Primates*, 43(3/4): 4 -5.

[148] Qi Chengjing, Yu Xunlin, Cao Tieru, et al. Flora of Huan Badagongshan Mountains and its phytogeographical significance [J].*Acta Botanica Yunnanica*, 16(4):321-332.

[149] Qin Zhongyun, Wang Lanhui, Zhao Tianzhong, et al. 2006. Resource characteristics and evaluation of Hupingshan National Nature Reserve [J]. *Journal of West China Forestry Science*, (3): 93-97,100.

[150] Qing Ya, Miu Ruhuai, Liao Wenbo. 1996. The study of subfamily Abietoideae (Pinaceae) flora from China [J]. *Supplement to the Journal of Sun Yatsen University*, (2): 91-96.

[151] Qiu Jiangpin. 1987. A preliminary investigation of Guizhou Fanjing Mountain of terrestrial Oligochaeta [J]. *Sichuan Journal of Zoology*, 6(4): 4-8.

[152] Qiu Jiangping, Wang Hong, Wang Wei. 1991. A strongly noncappable and non-branching degree[J]. *Guizhou Science*, 9(3): 220-226.

[153] Qiu Jiangping, Zhong Yuanhui. 1993. Notes on a new speeies and a newsubspecies of the genus metaphire from Guizhou Province, China [J]. *Guizhou Science*, 11(1): 38-44.

[154] Qiu Jiangping. 1988. Tow new species of the genus pheretima from Guizhou (ollgochaeta: megascolegidae)[J]. *Sichuan Journal of Zoology*, 7(1): 1-4.

[155] Qiu Lichuan, Xie Shulian. 1996. A preliminary study on the bryoflora of Guancen mountains forest area in Shanxi Province [J]. *Bulletin of Botanical Research*, (3): 310-314.

[156] Qiu Xuechao. 2011. The researchers on the innovative products in massif areas [D]. Chengdu: Southwestern University of Finance and Economics.

[157] Quan Guoqiang, Xie Jiahua. 2002. The Golden Monkey Research [M]. Shanghai: Shanghai Science and Technology Education Press.

[158] Ran Hui, Mei Jie, Yu Zhen, et al. 2012. A new record of snake in Fodingshan Mountain Nature Reserve of Guizhou Province and Snake Fauna Comparison between Foding Mountain and Fanjing Mountain[J]. *Journal of Anhui Agricultural Sciences*, 40(9): 5240-5242.

[159] Ran Hui, Mei Jie, Yu Zhen, et al. 2012. A new record of snake in Fodingshan Mountain Nature Reserve of Guizhou Province[J]. *Journal of Anhui Agricultural Sciences*, 40(1):199-200.

[160] Ran Jianghong, Liu Shaoying. 2002. An investigation report of Huanglong Nature Reserve[R]. Chengdu: Sichuan Forestry Publishing House.

[161] Ratajszczak R. Ngoc. C Pham N. 1992. A survey for tonkin Snub-nosed monkey (*Rhinopithecus avunculus*) in North Vietnam[R].

[162] Ren Xiaodong, Huang Mingjie, Melinda-K-horoldt. 2002. Participatory rural-appraisal (PRA) survey on Fanjingshan Nature Reserve [J]. *Journal of Guizhou Normal University (Natural Science Edition)*, (1):25-28.

[163] Ren Baoping, Li Ming, Weifuwen, et al. 2004. *Rhinopithecus bieti*[J]. *Chinese Journal of Zoology*, (5):111-104.

[164] Ren Yuanyuan. 2012. Response of vegetation cover changes to climate change in Daba Maintains [D]. Shanxi: Northwest University.

[165] Rushforth K. 1987. Conifers [M]. New York: Oxford, 71-87.

[166] Scientific investigation Editorial Council in Fanjingshan, Guizhou Province. 1987. Scientific Investigation in Fanjingshan, Guizhou Province [M]. Beijing: China Environment Science Press.

[167] Shen Xiaodong, Tan Ningmin, Li Hongxia, et al. 2013. Wild ornamental woody plant resources and gardens applied research in Fanjingshan National Nature Reserve[J]. *Forestry of Shanxi*, (3): 26-28.

[168] Shen Yuanping, Wang Jiangping, Lin Conghuai, etc. 2010. Research on the protection management mechanism of world natural heritage nominated property of Tainning[J]. *Issues of Forestry Economics*, 30(6):540-543.

[169] Shen Zehao, Fang Jingyun. 2001. Niche comparison of two fugus species based on the topographic patterns of their populations [J]. *Acta Phytoecologica Sinica*, 25(4): 392-398.

[170] Shi Shengde, Wang Qingbin, Zhang Zongshi, et al. 1994. New records of geographical distribution of actinidia in Guizhou[J]. *Guizhou Science*, 12(1): 6-7.

[171] Shi Shengde, Wang Qingbin, Zhang Zongshi, et al. 1994. The distribution of actinidia in Guizhou[J]. *Guizhou Science*, 12(2):58-61.

[172] Shi Xueqin, Wu Mingkai, Zhang Xiaoping. 2009. Studies on livewort flora in Huangshan[J]. *Plant Science Journal*, (4):368-372.

[173] State Forestry Administration. 2009. Survey of key land wild animals resources in China [M]. Beijing: China Forestry Press, 233-235.

[174] State Forestry Bureau. 2006. Technical specification for ecotourism planning in nature reserve (GB/T20416-2006)[S]. Beijing. Standards Press of China, pp. 2-8.

[175] Struhsaker T. T, Leland L. 1978. In: Smuts B B, et al. eds. Primate Societies[M]. Chicago: University of Chicago Press, pp. 83.

[176] Su Weici. The Endangered Situation Causes and Sustainable Utilization Strategies of Species Diversity of the rare Ornamental Plants in Guizhou Mountain [A]. Biodiversity Council, the Chinese Academy of Sciences, Department of Ecological and Natural Conservation, State Environment Protection Administration, Department of Wild life and Forest Plants Conservation, State Forestry Administration, Department of environmental protection of the State Oceanic Administration: The biodiversity conservation and research progress in China--Fifth National Conference Symposium of the conservation and sustainable utilization of biodiversity[C]. Biodiversity Council, the Chinese Academy of Sciences, Department of Ecological and Natural Conservation, State Environment Protection Administration, Department of Wild life and Forest

Plants Conservation, State Forestry Administration, Department of environmental protection of the State Oceanic Administration, 2002: 7.

[177] Su Y. J, Ren R.M, Yan K.H, et al. 1998. In: Jablonski N G, ed The National history of the doucs and Snub-nosed monkeys[M]. Singapore: World Scientific Publishing Co. Pte. Ltd, pp. 255.

[178] Sun Dunyuan, Gong Yazhen, Lei Xiaoping, et al.1999. Report of Conservation and PHVA Workshop of Guizhou Snub-nosed Monkey[R]. IUCN.

[179] Sun Dunyuan.1990. Research on Fanjingshan: Fanjing Mountain forest vegetation distribution characteristics [M].GuiYang: Guizhou Science and Technology Press, pp. 87-94.

[180] Sun Yegen. 1998. Studies on rare and endangered plants flora in Huangshan Mountain [J]. *Journal of Anhui Normal University (Natural Science)*, 21(1): 59-63.

[181] Takhtajan A.L. (translated by Huang G.). 1988. The Floristic Regionalization [M]. Beijing: Science Press.

[182] The County Annals' Compilation Commission of Songtao Miao Autonomous County. 1996. The County Annals of Songtao Miao Autonomous County [M].Guiyang: Guizhou People Press.

[183] The Editorial Committee of Fanjingshan study. 2013. Fanjingshan moss [M]. Guizhou: Guizhou Science and Technology Press, 48-50.

[184] The forest industry planning and design institute of State Forestry Bureau. 2013. The overall planning of ecological tourism of Fanjingshan National Nature Reserve in Guizhou Province (2014-2023) [Z]. Beijing. The forest industry planning and design institute of State Forestry Bureau, pp. 65-69.

[185] The Group for the Scientific Survey of the Fanjingshan Mountain. 1986. Comprehensive report on the scientific survey of the Fanjingshan Mountain Preserve. Scientific Survey of the Fanjingshan Mountain Preserve, Guizhou Province, China [M]. Beijing: China Environmental Science Press, pp. 1-12.

[186] The official website of Fanjingshan Scenic Area [DB/OL]. http://www.fjsfjq.com/fjs1/tour.asp.

[187] The People's Government of Jiangkou County. 2010. The Scenic Areas Overall Planning of Fanjing Mountain-Taiping River [Z]. Jiangkou, People's Government

of Jiangkou County, pp. 4-12.

[188] “The plan of conservation action of biodiversity in China Total report group”. 1994. The plan of biodiversity conservation action in China [M]. Beijing: China environmental science press.

[189] The State Council of the People's Republic of China. 1994. Regulations of the People's Republic of China on Nature Reserves [Z]. The State Council of the People's Republic of China. Pp. 5-9.

[190] The state forestry administration. The national nature reserve of the Dabashan Mountain in Chongqing [DB/OL]. http://www.forestry.gov.cn/

[191] The Official Tourism Website of Wulingyuan, Zhangjiajie City [DB/OL].http://www.hnzjj.com/

[192] The Official Website of World Heritage, NESCO[DB/OL].http://whc.unesco.org/

[193] Tian Chunyuan, Liu shengxiang, Lei Yun. 1998. A prelim inary study on the brvoflora of Shengnongjia National Nature Reserve in Hubei Province, China [J]. *Journal of Huazhong Normal University (Natural Science Edition)*, (2):86-89.

[194] Tourism Information Website of Ya'an City, Sichuan Province [DB/OL]. http://www.yata.gov.cn/wzya/

[195] Tu Yulin. 1991. Preliminary Research of the endemic plants in Guizhou (II) [J]. *Guizhou Forestry Science and Technology,* 19(4):71-78.

[196] Tu Yulin. 1992. Preliminary Research of the endemic plants in Guizhou (III) [J]. *Guizhou Forestry Science and Technology*, 20(2): 69-80.

[197] Tukasa Hukusima, Tetsuya Matsui, Takayoshi Nishio, et al. Phytosociology of the Beech (*Fagus*) Forests in East AsiaGeobotany Studies. *Springer-Verlag Berlin Heidelberg*.2013, pp. 1-8.

[198] Udvardy M.D.F. 1975. World Bio-geographical Provinces [J]. The Coevolution Quarterly Sausalito, California.

[199] UNESCO, World Heritage Centre. 2015. Operational Guidelines for the Implementation of the World Heritage Convention[Z]. Paris: UNESCO, World Heritage Centre, PP.50-53.

[200] United Nations Environment Program World Conservation Monitoring Centre.

2004. World Atlas of Biodiversity Earth's Living Resources in the 21st Century [M].

[201] Wang Chao, Tian Yingzhou, Gu Xiaoming. 2008. A new species of the genus paramesotriton (caudata, aslamandridae) [J]. *Acta Zootaxonomica Sinica*, 38(2): 388-397.

[202] Wang Hui. 2008. The research of the pteridophytes floristics and vertical distribution spectrum in Fanjingshan National Nature Reserve [D].Guiyang: Guizhou University.

[203] Wang Hui, Wei Qi, Wu Feifei, etc. 2014. The characteristics of pteridophytes flora in Mt. Fanjingshan Nature Reserve [J]. *Journal of Guizhou Normal University (Natural Sciences)*, 32(4):22-28.

[204] Wang Jihong, Qi Xiang, Zhou Yun, et al. 2011. Study on Distribution Status of Wild Coptis chinensis Resources and Associated Plants in Fanjingshan National Natural Preserve[J]. *Southwest China Journal of Agricultural Sciences*, 24(4): 1438-1445.

[205] Wang Lina, Jiang Xiaolong, Lei Yun, et al. 2012. A panbio-geographical explanation of the disjunet distribution of *Fagus*(Fagaceae)in the northern temperate zone[J]. *Chinese Journal of Plant Ecology*, 36(5):393-402.

[206] Wang Ling, Zheng Rongzhou, He Fei, et al. 2009. Reasearch on the bryoflora in the west of Sichuan Province, China [J]. *Journal of Sichuan Forestry* Science and Technology, 2009(01):18-23.

[207] Wang Min, Dai Chuangu, Wang Xuehua, et al. In-situ zircon geochronology and Hf isotope of muscovite-bearing leucogranites from Fanjingshan, Guizhou Province, and constraints on continental growth of the Southern China block [J]. *Earth Science Frontiers*, 2011, 18(5): 213-223.

[208] Wang Min, Dai Chuangu, et al. Sedimentation age of the Fanjingshan Group in East Guizhou Province: Evidence from in-situ zircon LA-ICP-MS U-Pb dating [J]. *Acta Petrologica & Mineralogica* .2012, 31(6): 843-857.

[209] Wu Mingkai, Shen Zhijun, Liu Hai, etc. 2012. Life table and survival analysis of natural *davidia involucrata* population in Fanjing Mountain Nature Reserve, Guizhou Province of Southwest China[J]. *Chinese Journal of Ecology*, 31(6):1419-1424.

[210] Wang Peishan, Wang Xiaoying. 1991. Research of the pteridophytes in Guizhou (Ⅰ)[J]. *Guizhou Science*, 21(3): 227-231.

[211] Wang S. 2004. Four new species of ripeacma from China (lepidoptera, oecophoridae) [J]. *Acta Zootaxonomica Sinica*, 29(2): 324-329.

[212] Wang Xianpu, Li Junqing. 1996. The beech forest of Lalashan Mountain in Taiwan and its ecological comparison with beech forest of Yuechengling Mountain in Guangxi [J]. *Guihaia*, 16(3):251-258.

[213] Wang Xiaoqin, Liu Shengxiang, Xiang Jun, et al. 2010. Study on phytogeography of mosses from Xingdoushan National Nature Reserve, Hubei[J]. *Journal of Wuhan Institute of Technology*, (05):49-52.

[214] Wang Yan, Yao Songlin, Qi Xiang, etc. 2009. Distribution of *Taxuschinensis* var. *mairer* resource in Fanjingshan Natural Reserve[J].*Southwest China Journal of Agricultural Sciences*, 22(4):1073-1076.

[215] Wang Yangeng. 1990. Fanjingshan Mountain——a rift basin in Proterozoic. Research of Fanjingshan Mountain [M]. Guiyang: Guizhou People's Publishing House, pp. 7-18.

[216] Wang Yangeng. The Grenville-age Orogenic Belt in the Fanjing Mountain Area and the rodinia supercontinent [J]. *Guizhou Geology*, 2001, 04: 211-216.

[217] Wen Rongsheng. 2003. On the distribution of Sub-nosed monkey the ancient and now and textual research [J]. *Nature Magazine*, (1):41-46, 2-63.

[218] Weng Dongming, Zhang Lei, Chen Xiaodong, et al. 2009. Species Diversity of Fagus hayatae Community in Qingliangfeng National Nature Reserve [J]. *Zhejiang Forestry Science and Technology*, 29(4):1-6.

[219] Wenzhou tourism website [DB/OL]. http://www.wzta.gov.cn/

[220] Wilfred H O. 1932. Marnmals of the Kelley-roosevelts and Delacour Asiatic Expeditions Zoological Series [Z]. Chicago, U.S.A.

[221] Winkler M G, P K Wang. The late-quaternary vegetation and climate of China in Global climates since the last glacial maximum [M]. London: University of Minnesota Press, 1993.

[222] Word Heritage Convention. 2014. World Heritage List [DB/OL]. http://whc.unesco.org/en/list

[223] World Conservation Union. 2014. IUCN species red list [DB/OL]. http://www.iucnredlist.org/

[224] Wu Chunsheng. 2003. Two new species of Lecithoceridae (Lepidoptera) from Mt. Fanjing, Guizhou Province, China [J]. *Entomotaxonomia*, 25(3): 209-211.

[225] Wu Gang, Li Junqing. Distribution, regeneration and succession of *Fagus* [J]. *Journal of Forestry Research*, 1998, 9(4), pp.290-291.

[226] Wu Gang. 1997. Distribution, growth and regeneration characteristics of *Fagus* in China [J]. *Chinese Journal of Ecology*, 16(4):16-51

[227] Wu Gang, Wang Hongchang, Fu Haiwei. et al. 2004. Habitat selection of Guizhou golden monkey (*Phinopithecus roxellanae brelichi*) in Fanjing Mountain Biosphere Reserve, China[J]. *Journal of Forestry Research*, l5 (3): 197-202.

[228] Wu Pengcheng, Jia Yu. 2006. There regionalization and distribution types of the bryophytes in China [J]. *Journal of Plant Resources and Environment*, 15(1): 1- 8.

[229] Wu Pengcheng, Li Dengke, Gao Caihua.1987. Relationships between the bryoflora of Mt. Wuyi, SE China, and those of Neighbouring Mountain Regions [J]. *Journal of Plant Taxonomy*.

[230] Wu Pengcheng, Luo Jianxin, Wangmeizhi, et al. 1994. Basic Features and Special Characteristics of the Bryophytes Flora in Hengduan Mountains [A]. China's Qinghai Tibet Plateau Research Association [C]. Symposium on the Qinghai Tibet Plateau and Global Change, PP. 7.

[231] Wu Jiayan. Li Guihui. 1982 A report on the mammals of Ankang region, Shanxi Province [J]. *Zoolgoical Research*. 3(1)59-68

[232] Wu Zhengyi, Sun Hang, Zhou Zhekun. 2011. Seed Plants Geography of China [M]. Beijing: Science Press.

[233] Wu Zhengyi. 1991.The Areal-types of the World Families of Seed Plants. (4)：1-139.

[234] Xiang Xiaoguo, Cao Ming, Zhou Zhekun, 2006. Fossil history and modern distribution of the genus *Abies* (Pinaceae) [J]. *Acta Botanica Yunnanica*, 28(5):439-452.

[235] Xiang Zuofu, Liang Wenbin, Nie Shuaiguo. et al. 2012. Diet and feeding behavior of *Rhinopithecus brelichi* at Yangaoping, Guizhou[J]. *American Journal*

of Primatology, 74: 551–560.

[236] Xiang Zuofu, Nie Shuaiguo, Lei Xiaoping, et al. 2009. Current status and conservation of the gray snub-nosed monkey *Rhinopithecus brelichi* (Colobinae) in Guizhou *China*[J]. *Biological Conservation*, 142 (3), 469-476.

[237] Xie jiahua, Liu yuming, Yang yeqing. Ecology of the wild Guizhou Snub-nosed monkey [M]. Guiyang: Guizhou Science and Technology Press, 2012: 205-211.

[238] Xie Junli, He Shunzhi, Xu Wenfang, et al. 2012. Study on Germplasm resources of medicinal plants smilax in Guizhou[J]. *Seed*, 31(1): 63-66.

[239] Xie Yintang. 1991. Three new names of ferns in nomenclature [J]. *Bulletin of Botanical Research*, 11(3): 27-28.

[240] Xie Renbo, Mao Jiang, Bai Qinqin. 2015. The climate characteristics of Fanjing Mountain and the preliminary analysis of tourism climate [J]. *GuiZhou Meteorological*, 39(2):34-36.

[241] Xing Qishun, Mayongbin. 2004. The transmutation of traditional culture sactions about the northest Guizhou Miao in forest management and protection [J]. *Forestry and Society Newsletter*, 12(1):17-22.

[242] Xiong Yuanxin, Luo Yingchun, Shangguan Fazhi, et al. 2007. Corybas fanjingshanensis Y. X. Xiong, a New Species of Orchidaceae from Guizhou, China [J]. *Journal of Systematics and Evolution*, 45(6): 808-812.

[243] Xiong Yuanxin, Shi Lei. 2014. Moss on Mount Fanjing[M]. Guiyang: Guizhou Science and Technology Press.

[244] Xiong Yuanxin, Yang Chuandong. 2009. Common arbor species in Mount. Fanjing National Nature Reserve [M]. Guiyang: Guizhou Science and Technology Press.

[245] Xu Dongyan. 2003. An Analysis of Seed Plants Floral Composition in Dabashan Nature Reserve [J]. *Journal of Southwest China Normal University (Natural Science*, 28(6):963-968.

[246] Xu Fangling. 2008. A taxonomic study on phasmatodea in Guizhou [D]. Guiyang: Guizhou University.

[247] Xu Jie, Wen Tao, Long Xiuqin, et al. 2009. Woody oil plant resources in Guizhou Province[J]. *Guizhou Forestry Science and Technology*, 37(3): 23-27.

[248] Xu Wenfang, Huang Min, He Shunzhi. 2012. Investigation on new medicinal resources of Orchidaceae in Guizhou [J].*Guizhou Agricultural Sciences*, 40(8):18-21.

[249] Xu Zaifu, He Junhua, Yao Songlin. 1997. Descriptions of three new specles of the genus aphelopos dalman form Mt. Fanjingshan, (1tymenoptera: Dryinidae) [J]. *Zoological Research*, 8(1): 7-11.

[250] Xu Zaifu, He Junhua, Yao Songlin. 1997. Descriptions of three new specles of the genus aphelopos dalman form Mt. Fanjingshan, (Ltymenoptera: Dryinidae) [J]. *Zoological Research*, 8(1): 7-11.

[251] Xue Wanqi, Chen Hongwei, Cui Yongsheng. 1997. Three new species of the genus Phaonia from Fanjing Mountian, China (diptera: muscidae) [J]. *Acta entomologica sinica*, 40(3): 305-310.

[252] Xuming Zhou, Boshi Wang, Ming Li, et al. 2014. Whole-genome sequencing of the Snub-nosed monkey provides insights into folivory and evolutionary history [J]. *Nature Genetics* ,1303-1312

[253] Yan Fulin, He Shuncai, Xu Wenfang. 2013. Study on species and geographic distributions of the resources medicinal plants of Ionicera L. in Guizhou Province [J]. *Guizhou Sciences*, 31(2): 31-36.

[254] Yang Chenjing. 1988. Investigation report on insects of Fanjing Mountain [J]. *Guizhou Science*, (S1): 4-15.

[255] Yang Chuandong, Shi Lei, Yang Ni, et al. 2012. New records of seed plants to Guizhou Provinces(II)[J]. *Guizhou Agricultural Sciences*, 40(12): 27-29.

[256] Yang Chuandong, Zhang Yuwu, Shi Lei. 2011. New geographical distribution of spermatophyta in Guizhou Province [J]. *Seed*, 30(11):68-69.

[257] Yang Ding, Yang Jikun. 1988. Three new species of dance flies in Fanjing Mountain [J]. *Guizhou Science*, 30(1): 95-97.

[258] Yang Ding, Yang Jikun. 1993. New and little-known species of plecoptera from Guizhou Province (III) [J]. *Entomotaxonomia*, 15(4): 235-238.

[259] Yang H.L, Li D.Q, Duo H.R, 2010, MA J. Vegetation distribution in Fanjing Mountain Nature Reserve and habitat selection of Guizhou golden monkey [J]. Forest Research, 23(3):393-398.

[260] Yang Hailong, Li Diqiang, Cheng Gang. 2013. Habitat suitability evaluation for *Rhinopithecus brelichi* in Fanjing Mountain, Guizhou Province [J]. *Journal of Anhui Agriculture Science*, 41(8): 3403-3406.

[261] Yang Jikun, Liang Chunmei, Chen Hongye. 1987. Notes on campylotes (Zygaenidae: Leploopetra) with two new species and a new genus from Guizhou,China[J]. *Guizhou Science*, (2): 1-9.

[262] Yang Jikun, Wang Xiangxian. 1988. A New record of chrysopids form Fanjingshan Mountain [J]. *Guizhou Science*, (S1): 106-108.

[263] Yang Jikun, Wu Hong. 1988. Five new species of genus mycomya from Fanjing Mountain [J]. *Guizhou Science*, (S1): 128-135.

[264] Yang Jikun, Yang Chunqing. 1988. A description of new species cryptochaetum Fanjingshan from Guizhou (Diptera:cryptochaetidae)[J]. *Guizhou Science*, (S1): 145-147.

[265] Yang Jikun, Yang Ding. 1991. New and little-known species of plecoptera from Guizhou Province (II) [J]. *Guizhou Science*, 9(1): 48-50.

[266] Yang Jikun, Zhang Xiaochun. 1988. The dermaotera of Fanjing Mountain, with descriptions of 4 new species [J]. *Guizhou Science*, (S1): 62-69.

[267] Yang Jikun, Zhang Xuemin. 1988. Eleven new species of sciarid from Fanjingshan [J]. *Guizhou Science*, (S1): 115-127.

[268] Yang L, Emily L. 2002. The particular foods resources and constitent characteristic of the vegetation in habitat of Guizhou Golden Monkey in the Fanjing Mountain [J]. *Journal of Guizhou Normal University (Natural Sciences)*, (1):18-24.

[269] Yang Mingde. 1986. Geomorphology and recent crustal movement of the Fanjingshan Mountain area. Scientific survey of the Fanjingshan Mountain Preserve, Guizhou Province, China [M]. Beijing:China Environmental Science Press, pp. 44-55.

[270] Yang Ning, Xiong Yuanxin, et al. 2007. Zhou Yan, New recordes of brachythec laceae in Guizhou province, China[J]. *Journal of Mountain Agriculture and Biology*, (2):136-141.

[271] Yang Yeqin, Lei Xiaoping, Yang Chuandong. 2002. Research on Fanjingshan:

field ecology of Rhinopithecus brelichi [M]. Guiyang: Guizhou Science & Technic Press.

[272] Yang Yeqin, Lei Xiaoping, Yang Chuandong. 2002. Research on Fanjingshan: field ecology of *Rhinopithecus brelichi* [M]. Guiyang: Guizhou Science & Technic Press.

[273] Yang Yeqin,Xu Youyuan, Tu Yulin. 1986. Guizhou fanjing mountains expedition set: Fanjing mountains nature reserve, dovetree Lin [M]. Beijing: China environmental science press, 147-153.

[274] Yang Yeqin.1990. Research on Fanjingshan: the forest type in fanjingshan(Ⅴ)[M]. GuiYang: Guizhou Science and Technology Press, 188-199.

[275] Yang Yupo, Li Chengbiao. 1992. Sichuan forest [M]. Beijing: China forestry publishing house.

[276] Yang Xiuqiang.1997.Discussion on exploitation and utilization in tourism resources of Fanjing Mountain [J]. *GuiZhou Ethnic Studies*, (3):58-60.

[277] Yao Jiahua, Zhang Huahai. 2012. New records III of seed plant in Guiyang city [J]. *Seed*, 31(10): 71-74.

[278] Yao Junjie. 2000. Passeriformes birds in Fanjingshan Mountain [J]. *Journal of Tongren University*, 13(4): 129-132.

[279] Yao Junjie. 2000. Passeriformes birds in Fanjingshan Mountain [J]. *Journal of Tongren University*, 13(4): 129-132.

[280] Ye Xiyang, Wu Difei, Li Genyou, et al. 2010. Two new records of seed plant from Zhejiang Province, China[J]. J*ournal of Zhejiang A&F University*, 27(3): 478-479.

[281] Yin Jianqiang. 1984. The preliminary discussion of *Castanopsis fargesii* community in Fanjingshan [J]. *Guizhou Forestry Science and Technology*, (3): 62-66.

[282] Yu Tianhong. 2002. Comparison between the flora of Mt. Fanjingshan and Maolan Area [J]. *Journal of Guizhou Normal University (Natural Sciences)*, 20(2): 50-54.

[283] Yuguizhong. The function of the customary law of ethnic minorities in forest environment protection -- Taking the Guizhou Miao and Dong nationality customs as an example [J]. *Guizhou Univercity Press (Social Science Edition)*, 2006,

24(5):36-41.

[284] Zang Min, Bian Xinmin, 2003, Investigation on angiosperm plants in Sanqingshan Mountain, Jiangxi Province [J]. *Subtropical Plant Science*, 32(3): 38-41.

[285] Zang Min, Qiu Xiaolan, Yao Lifang, et al. 2014. Analysis of geographic elements of the rare and endangered plants of Sanqing Mountain in Jiangxi Province [J]. *Journal of Fujian Forestry Science and Technology*, 41(1)74-80.

[286] Zhang Chunlin, Chen Hanbin. 2009. A new spicies of simulium (simulium) blackfly from FanJing Mountain of Guizhou [J]. *Journal of Guiyang Medical College,* 25(3): 221-223.

[287] Zhang Lei, Chen Hong, Zeng Qiang. 2010. A new amphibian record in Guizhou Province Rhacophorus leucofasciatus[J]. *Chinese Journal of Zoology*, 45(3): 159-162.

[288] Zhang Lei, Liang Li, Ran Hui, et al. 2012. Megophrys binlingensis fanjingmontis: A new subspecies of megophryidae from Guizhou[J]. *Chinese Journal of Zoology*, 47(4): 135-138.

[289] Zhang Lei, Ran Hui, Liang Li, et al. 2011. Reptiles resources in Fanjing Mountain National Nature Reserve[J]. *Journal of Tongren University*, 13(4): 129-132.

[290] Zhang Lei, Ran Hui, Shen Zhenxiong, et al. 2010. New records of amphibians in Guizhou province-*Rana zhenhaiensis*[J]. *Journal of Anhui Agricultural Sciences*, (26): 108-109.

[291] Zhang LIXia, Zhang Feng, Shangguan Tieliang, 2000. Vegetation diversity of Luya Mountains [J]. *Chinese Biodiversity*, 8(4): 361-369.

[292] Zhang Luqing. 2003. Characteristics and protection of biodiversity in Baishanzu Nature Reserve [J]. *Journal of Zhejiang for Science & Techque*, 23(1):5-9.

[293] Zhang Ronghai. 1997. Fanjingshan God [M]. Guiyang: Guizhou people press.

[294] Zhang Rongzu. 2011. China animal geography [M]. Beijing: Science Press.

[295] Zhang Shaobing. 2004. Studies on the Community Characteristics of *Pseudotsuga sinensis* Stand in Yangming Mountain of Hunan Province in China. Life Science Research.02:178-184.

[296] Zhang Tao, Teng Jirong, Wang Hongjian. 2005. Present situation of ecological habits and resources Gansu Baishuijiang National Nature Protection Area of Macaca thibetana [J]. *Sichuan Journal of Zoology*, 24(2):165-167.

[297] Zhang Y.W, Li D.Q, Liu Y.Y, et al. 2015, Investigation of conservation plants of Fanjing Mountaion in forest ecosystem, Research Station [J]. Guizhou Science, 33(1):85-91.

[298] Zhang Yongtian, Huang Chengjiu. 1998. Flora reipublicae popularis sinicae tomus 22[M]. Beijing: Science Press, 1-8.

[299] Zhang Yurong, Zhang Guozhen, Zhong Wuhong, et al. 2005. The types and characters of the forest plant community of Huping Mountain State Natural Protection Zone [J]. *Hunan Forestry Science and Technology*, 3(1): 14-18, 22.

[300] Zhang Yuwu, Yang Hongping. 2003. The characteristics of the resources of Liana in Fanjingshan Biosphee Reserve, Guizhou, China [J]. *Guizhou Science.* 21(3):75-80.

[301] Zhang Yuwu, He Yunsong, Liu Yingying, etc. 2015. Investigation of conservation plants of Fanjing Mountain in forest ecosystem research station [J]. *Guizhou Science*, 33(1):85-91.

[302] Zhang Yuwu. 2000. Studies on climbing fashions and types of Liana in Fanjingshan Nature Reserve, Guizhou, China [J]. *Guihaia*, 20(4):301-312.

[303] Zhang Yuwu. 2007. A list of the Orchid plants in Fanjing Mountain National Nature Reserve, Guizhou, China [J]. *Guizhou Science*, 25(1): 43-53.

[304] Zhang Yuwu, Yang Hongping. 2001. The studies on flora and ecological features of Liana in Fanjing Mountain National Nature Reserve, Guizhou, China .Attach a List of Liana in the Fanjing Mountain [J]. *Journal of Wuhan Botanical Research*, 19(4):269-298.

[305] Zhangming. 2014. The study on cultural and ecological protection of Buddhism in Fanjingshan [J]. *Guizhou Univercity Press (Social Science Edition)*, 32(2):55-60.

[306] Zhangming. The origins of Buddhism in Fanjingshan [J].*The study of Buddhism*, 2005, (00):284-293.

[307] Zhao Zuntian, Zhang Enran Huang Yuqian. 2003. Studies on the bryophyte flora

of Mountain Tai in Shandong [J]. *Shangdong Science*, (3): 18-23.

[308] Zhong Bengu, Jiang Shouzhong. 1983. Preliminary study on bryophytes in Fanjingshan [J]. *Guizhou Forestry Science and Technology*, (4): 10-37.

[309] Zhong Yan, Xiong Kangning, Du Fangjuan. 2014. Landscape aesthetic value of nominated Huanjiang Karst World Heritage and its comparative analysis based on world heritage criteria [J]. *Journal of Kunming University of Science and Technology (Natural and Science Edition)*, 39(3):25-32.

[310] Zhou Jiang, Yang Tianyou. 2009. Two new records of vespertilionidae in Guizhou Province [J]. *Sichuan Journal of Zoology*, 28(6): 925.

[311] Zhou Jiang, Yang Tianyou. 2012. A new record of myotis blythii in Guizhou Province [J].*Sichuan Journal of Zoology*, 31(1): 120-122,177.

[312] Zhou Jiang, Yang Tianyou. 2012. A new record of nyctalus aviator in Guizhou Province [J]. *Chinese Journal of Zoology*, 47(1): 119-123.

[313] Zhou W. 2003. Four new species of mecoptera from China [J]. *Wuyi science journal*, (19): 88-99.

[314] Zhou Zhekun. 1999. Fossils of the Fagaceae and their implications in systematics and biogeography [J]. *Acta Phytotaxonomica Sinica*, 37,369-385.

[315] Zhou Zhengxian, Yang Yeqin, Chen Kexian, et al. 1990. Research for Fanjingshan [M]. Guiyang: Guizhou People Press.

[316] Zhu Chuandian, Sha Yuhua. 1986. A new species of spider of the genus Neriene from China (Araneae: Linyphiidea) [J]. *Acta Zootaxonomica Sinica*, 11(2): 163-165.

[317] Zhu Shouqian, Yang eq in.1990. Research on Fanjingshan [M].GuiYang: Guizhou People Press, 95-252.

[318] Zhu Shouqian, Yang Yeqin. 1987. A preliminary study of mossy elfin forest in Fanjing Mountain of Guizhou Province [J]. *Journal of Plant Ecology*, 11(2):92-105.

[319] Zhu Shouqian, Yang Yeqin. 1985. The structure and trends of *Fagus lucida* forest in Guizhou [J]. *Plant ecology and geobotanica sinica*, 9(3):183-191.

[320] Zhu Y, He J, Yang Z. et al. 2007. Study on medicinal plant resources of *Rubus* in Fanjing Mountain Nature Reserve in Guizhou Province [J]. *Journal of Anhui*

Agricultural Science, 35(29): 9279-9280.

[321] Zhu Yinan, He Jiawei, Yang Zhengsong, et al. 2007. The investigation and exploitation of Rubus L. Resources of Fanjing Mountain Nature Reserve in Guizhou Province [J]. *Chinese Agricultural Science Bulletin*, 23(9):504-508.

[322] Zhu Yingan, He Jiawei, Yang Zhengsong, et al. 2007. The investigation and exploitation of Rubus L. Resources of Fanjing Mountain Nature Preserve in Guizhou Province [J]. *Chinese Agricultural Science Bulletin*, 23(9): 504-508.

[323] Zou Tiancai. 2001. Study on germ plasma resources and utilization evaluation for Guizhou endemic spermatophyte [J]. *Scientia Silvae Sinicae*, 37(3): 46-57.

8. Contact Information of Responsible Authorities

8.a Preparer

8.b Official local institution/agency

8.c Other local institutions

8.d Official web address

8. Contact Information of responsible authorities

8.a Preparer

Name: Xiong Kangning

Title: Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13608547678

Fax: +86-851-86690478

E-mail: xiongkn@163.com

Name: Chen Hu

Title: Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13809432462

Fax: +86-851-86690478

E-mail: gy_chenhu@163.com

Name: Rong Li

Title: Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13984416097

Fax: +86-851-86690478

E-mail: 545568255@qq.com

Name: Ying Bin

Title: Associated Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country:

Guiyang, Guizhou, China

Tel: +86-18508501461

Fax: +86-851-86690478

E-mail: fighterbin@126.com

Name: Du Fangjuan

Title: Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country:
Guiyang, Guizhou, China

Tel: +86-13765109063

Fax: +86-851-86690478

E-mail: dfj521@sina.com

Name: Xiao Shizhen

Title: Associated Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13985198303

Fax: +86-851-86690478

E-mail: xiaosz2004@163.com

Name: Peng Huirong

Title: Associate Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13511914305

Fax: +86-851-86690478

E-mail: 3027189@qq.com

Name: Gao Yang

Title: Associated Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-15802874312

Fax: +86-851-86690478

E-mail: 35222461@qq.com

Name: Li Xiaona

Title: Associated Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-13658518788

Fax: +86-851-86690478

E-mail: maidoulxn413@163.com

Name: Sheng Maoyin

Title: Professor

Address: School of Karst Science, Guizhou Normal University, No.116 Baoshan North Road, Guiyang, Post Code 550001

City, Province/State, Country: Guiyang, Guizhou, China

Tel: +86-18984857437

Fax: +86-851-86690478

E-mail: shmoy@163.com

8.b Official Local Institution/Agency

Name: National Commission of the People's Republic of China for UNESCO

Address: No.37, Damucang Hutung, Xidan, Beijing, China, Post Code100816

Tel: +86-10-66096306

Fax: +86-10-66017912

E-mail: moe@moe.edu.cn

Web Address: http://www.moe.edu.cn/

Name: Ministry of Housing and Urban-Rural Development of the People's Republic of China

Address: No.9 Sanlihe Road, Beijing, China, Post Code 100835

Tel: +86-10-58934062

Fax: +86-10-58933014

E-mail: zuoxp@mail.cin.gov.cn

Web Address:
http://www.mohurd.gov.cn/

Name: Department of Housing and Urban-Rural Development of Guizhou Province

Address: No.2, West Yan'an Road, Guiyang, Guizhou Province, China

Post code 550003

Tel: +86-851-85360262

Fax: +86-851-85360267

E-mail: xgl9596@163.com

Web Address: http://www.gzjs.gov.cn/

Name: Forestry Department of Guizhou Province

Address: No.91, West Yan'an Road, Guiyang, Guizhou Province, China

Post code 550001

Tel: +86-851-856570806

Fax: +86-851-86570806

E-mail: rjc68cn@163.com

Web Address:
http://www.gzforestry.gov.cn/

Name: Office of the Leading Group for World Heritage Application of Tongren City

Address: No. 12 Building, Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China

Post code 554300

Tel: +86-856-8122180

Fax: +86-856-8122180

E-mail: 423425444@qq.comWeb Address: http://www. fjs.gov.cn/

Name: Administration of Guizhou Fanjingshan National Nature Reserve

Address: No. 17 West Sanxing Road, Shuangjiang Town, Jiangkou County, Tongren City, Guizhou Province, China, Post code 554400

Tel: +86-856-6620157

Fax: +86-856-6620157

E-mail: fjshanzwy@aliyun.com

Web Address: http://www.fanjingshan.cn/

Name: Administration of Guizhou Yinjiang Yangxi Provincial Nature Reserve

Address: No.313 Fanjingshan Road, Eling Street Office, Yinjiang County, Tongren City Guizhou Province, China, Post code 555200

Tel: +86-0856-6222385

Fax: +86-0856-6222385

E-mail: yjLyj6222385@163.com

Web Address: http://www.fanjingshan.cn

8.c Other Local Institutions

Name: Forestry Bureau of Tongren City

Address: No.9 Jiulong Road, Kaifa District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-5223289

Fax: +86-0856-5214880

E-mail: trdqLyj@163.com

Name: Administration of Housing and Urban-Rural Development of Tongren City

Address: No.382 Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-5285056

Fax: +86-0856-5280920

E-mail: 605578742@qq.com

Name: Urban and Rural Planning of Tongren City

Address: No.382 Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-5281832

Fax: +86-0856-5281832

E-mail: 1094712795@qq.com

Name: Tourism Development Committee of Tongren City

Address: No.319 Dongtai Road, Bijiang District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-4123335

Fax: +86-0856-4123335

E-mail: trLwj@126.com

Name: Water Affairs Administration of Tongren City

Address: No.58 Huandong Road, Bijiang District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-5222842

Fax: +86-0856-5210408

E-mail: trsw@163.com

Name: Science and technology Administration of Tongren City

Address: No.18 Huaguoshan Middle Road, Bijiang District, Tongren City, Guizhou Province, China, Post code 554300

Tel: +86-0856-5223506

Fax: +86-0856-5223506

E-mail: trskjj@163.com

Name: Forestry Administration of Jiangkou County

Address: No.2 Huancheng North Road, Shuangjiang Town, Jiangkou County, Tongren City Guizhou Province, China, Post code 554400

Tel: +86-0856-6621143

Fax: +86-0856-6621143

E-mail: 541841631@qq.com

Name: Forestry Administration of Yinjiang Tujia and Miao people Autonomous County

Address: No.313 Fanjingshan Road, Eling Street Office, Yinjiang County, Tongren City Guizhou Province, China, Post code 555200

Tel: +86-0856-6222385

Fax: +86-0856-6222385

E-mail: yjLyj6222385@163.com

Name: Forestry Administration of Songtao Miao people Autonomous County

Address: No.7 Nanmenwan, Liaogao Town, Songtao County, Tongren City Guizhou Province, China, Post code 554100

Tel: +86-0856-2838173

Fax: +86-0856-2838173

E-mail: 1036232535@qq.com

8.d Official Web address

http: //www.mohurd.gov.cn

Contact name: Zuo Xiaoping, The Ministry of Housing and Urban-Rural Development of the People's Republic of China

E-mail: zuoxp@mail.cin.gov.cn

http: //www.gzgov.gov.cn

Contact name: Tian Jun, The People's Government of Guizhou Province

E-mail: gzzb777@tom.com

http: //www.gzjs.gov.cn

Contact name: Xiao Gaoling, The Department of Housing and Urban-Rural Development of Guizhou Province

E-mail: xgl9596@163.com

http: //www.yinjiang.gov.cn

Contact name: Dai Zhongyi, The People's Government of Yinjiang Tujia and Miao people Autonomous County

E-mail: ZYY8862004@126.com

http: //www.trs.gov.cn/

Contact name: Yang Zhen, The People's Government of Tongren City

E-mail: xsmslk@163.com

http: //www.jiangkou.gov.cn

Contact name: Liu Hongli, The People's Government of Jangkou County

E-mail: jkzfdzzw@163.com

http: //www.songtao.gov.cn

Contact name: Shen Jing, The People's Government of Songtao Miao people Autonomous County

E-mail: 297202479@qq.com

9. Signature on Behalf of the State Party

9. Signature on behalf of the State Party

Chen Zhenggao
Minister of Housing and Urban-Rural Development
of the People's Republic of China