



Regular article

Analysis of vascular plant resources and diversity in Fanjing Mountain, Guizhou Province

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Abstract

Fanjing Mountain Nature Reserve is located at the junction of Jiangkou, Yinjiang and Songtao counties in the Tongren region of Guizhou Province. Because of the topography and humid climate of the central subtropical monsoonal mountains, the plant species in this area are rich and diverse. The vascular plant resources and diversity of Fanjing Mountain Nature Reserve in Guizhou Province were studied through field survey, literature review and specimen identification. The results show that there are 284 species of vascular plants in the region, belonging to 205 genera in 93 families, mainly angiosperms. Liliaceae, Asteraceae, Polygonaceae, Leguminosae, Ranunculaceae and Polygonum have the most species, followed by Sedum, Dioscorea, Actinidia Lindl and Thalictrum. In terms of life types, perennial herbs are the most dominant, accounting for 68.47% of the total number of species, and annual (or biennial) herbs, shrubs and vine types also present. There are 222 species identified as medicinal vascular plants, accounting for 78.2% of the total number of species. The medicinal parts are primarily found in the whole herb category, followed by the root and rhizome category.

Keywords: plant resources; diversity; medicinal use; conservation and utilization; Fanjing Mountain Nature Reserve

1 Introduction

Fanjing Mountain Nature Reserve (FMNR) is located at the junction of Hunan, Chongqing and Hubei provinces. It covers parts of Jiangkou, Yinjiang and Songtao counties in Tongren region, with an altitude of 2,572 m, and is the main peak

of the Wuling Mountains. FMNR is characterized by a dome-shaped mountain ecosystem with fascinating subalpine and hilly landscapes. FMNR is located in the middle of the central subtropics, on the transitional slope between the Yunnan-Guizhou Plateau and the hills of western Hunan. It has preserved the ancient animal and plant species and rich biological resources from Paleocene to Quaternary Periods 2-70 million years ago. Among them, there are 6 national protected plants: *Davidia involucrate* Baill. var. *vilmorinan* (Dode) Wanger, *Abies fanjingshanensis*, *Bretschneidera sinensis* Hemsl, *Taxus wallichiana* var. *chinensis*, *Mussaenda*

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shikokiana Makino [1,2].

The plant species of FMNR are rich and diverse, including higher plant types such as mosses (77 families), ferns (28 families), gymnosperms (7 families) and angiosperms (155 families), as well as lower plant types, such as freshwater algae (36 families), lichens (22 families) and fungi (65 families). FMNR is one of the three major distribution centers of mosses in China, where there are 75 species of endemic bryophytes, among which, *Distichophyllum oblongum*, a spatulate yellow moss, is endemic to FMNR. The dominant families of ferns include the Dryopteridaceae, Polypodiaceae and Pteridaceae. Important families of gymnosperms are Pinaceae and Cephalotaxaceae. In addition, there are also families endemic to China, such as Ginkgoaceae and Eucommiaceae [3]. The average annual temperature of FMNR ranges from 5.0 to 17.0 °C, the average temperature in January is 3.1-5.8 °C, and the average temperature in July is 15-27.4 °C. The FMNR area is rich in water, and the average annual precipitation ranges from 1,100 to 2,600 millimeters. The climate type of FMNR is the humid climate in the middle-subtropical monsoon mountains, with abundant water and heat resources, diverse vertical changes and obvious vertical climate and vegetation zones [4].

2 Materials and methods

In July 2016, the 10th scientific expedition of Chinese Medicine Resources of Shenyang Pharmaceutical University conducted a scientific expedition on the road to the summit of FMNR. A route survey of representative Nature Reserves was carried out, collecting specimens along the way, taking photos, and recording detailed information of the collection place, time, and main morphological

characteristics of plants. GPS recorder was used to record latitude and longitude throughout the survey.

The species of vascular plants on the summit of FMNR was identified according to Flora of China [5] and Flora of Guizhou [6], and a total of 284 species of vascular plant resources were obtained. On this basis, the list of vascular plants that can be used as medicine was screened out according to National Compilation of Chinese Herbs [7], Chinese Materia Medica [8], and other references, and a total of 222 species were identified. Diversity of vascular plant resources in FMNR was then analyzed and evaluated, and the corresponding suggestions for development, utilization and conservation were put forward.

3 Results

3.1 Analysis of the composition of vascular plant species in FMNR

According to the results shown in Table 1, there are 284 species of vascular plants, belonging to 93 families and 205 genera in FMNR. Among them, there are 15 families, 25 genera, and 36 species of ferns. In contrast, there are only one family, one genus, and one species of gymnosperms. The species in FMNR are mainly angiosperms, with 77 families, 179 genera and 247 species (including 67 families, 153 genera, and 219 species of dicotyledons, and 10 families, 26 genera, and 28 species of monocotyledons). At the level of family, genus and species, angiosperms are the most abundant, accounting for 82.80% of the total number of families, 87.32% of the total number of genera, and 86.97% of the total number of species. In contrast, gymnosperms and ferns are relatively less few.



Table 1 Vascular plant species in FMNR

Plant type	No.families	Ratio/%	No.genera	Ratio/%	No. species	Ratio/%
Pteridophytes	15	16.13	25	12.20	36	12.68
Gymnosperms	1	1.08	1	0.49	1	0.35
Angiosperms	77	82.80	179	87.32	247	86.97
Dicotyledons	67	72.04	153	74.63	219	77.11
Monocotyledons	10	10.75	26	12.68	28	9.86
Total	93	100.00	205	100.00	284	100.00

3.2 Analysis of the genus composition of vascular plant families in FMNR

As shown in Table 2, there are 78 families containing 1-5 species, accounting for 83.87% of the total number of families. There are 12 families

containing 6-10 species, accounting for 12.90% of the total number of families. However, there are only 3 families containing more than 10 species, accounting for only 3.23% of the total number of families.

Table 2 Species in different families of vascular plants in FMNR

No.species within families	No.families	Ratio/%	No.species	Ratio/%
One species	34	36.56	34	11.97
2-5 species	44	47.31	140	49.30
6-10 species	12	12.90	71	25.00
>10 species	3	3.23	39	13.73

As shown in Table 3, the genus containing only one species is dominant. Among the 205 genera of vascular plants, 152 genera contain only one species, accounting for 74.15% and 52.46% of the total number of genera and species, respectively. There are 52 genera containing two to five species,

accounting for 25.37% of the total number of genera, but they contain a large proportion of species, accounting for 44.72% of the total number of species. Only one genus contains more than five species, accounting for 0.48% of the total number of genera.

Table 3 Species in different genus of vascular plants in FMNR

No.species within genus	No. genera	Ratio/%	No.species	Ratio/%
One species	152	74.15	149	52.46
2-5 species	52	25.37	127	44.72
>5 species	1	0.48	8	2.82

3.3 Analysis of vascular plant life types in FMNR

Statistical analysis of the different life types of vascular plants in FMNR shows that perennial herbaceous plants are dominant, with 160 species,

accounting for 56.34% of the total number of species (Table 4), followed by annual (or biennial) herbaceous plants with 33 species, accounting for 11.62% of the total number of species. There are 60 species of shrubs, accounting for 21.13% of the



total number of species. There are 8 species of trees, accounting for 2.81% of the total number of species. There are 31 species of bryophytes, accounting for 10.92% of the total number of species. The above analysis shows that the vascular plants in FMNR are rich and diverse.

Table 4 Different life cycle types of vascular plants in FMNR

Plant type	No. species	Ratio/%
Perennial herbs	160	56.34
Therophyte/Biennial	33	11.62
Shrub	60	21.13
Arbor	8	2.82
Vine	31	10.92

3.4 Analysis of the diversity of medicinal vascular plants in FMNR

There are 222 species of vascular plants with medicinal value in 61 families and 158 genera in FMNR, accounting for 65.59%, 77.1%, and 78.2% of the total number of families, genera and species, respectively (Table 5). The top families of medicinal vascular plants are Liliaceae (13), Leguminosae (10), Compositae (15), Salicaceae (11) and Ranunculaceae (10). The major genera are *Polygonum* (8), *Dioscillus* (4) and *Thalictrum* (3). The life types of medicinal plants are predominantly herbs, with 152 species, accounting for 68.47% of the total number of species of medicinal vascular plants.

Table 5 Diversity of medicinal vascular plants in FMNR

Species composition (ratio)	61 family (65.59%)	158 genus (77.1%)	222 species (78.2%)
Main families and genera (No. species)	Liliaceae (13)		<i>Polygonum</i> (8)
	Leguminosae (10)		<i>Dioscillus</i> (4)
	Compositae (15)		<i>Actinidia</i> (4)
	Salicaceae (11)		<i>Sedum</i> (4)
	Ranunculaceae (10)		<i>Thalictrum</i> (3)
Plant type (No. species)	Herb	152 (68.47%)	
	Shrub	44 (19.82%)	
	Vine	26 (11.71%)	

Medicinal plants of FMNR can be divided into whole herbs, roots and rhizomes, flowers, branches and leaves, fruits and seeds. The results show that there are 111 species of medicinal plants in the whole herb category (Table 6), accounting for 50% of the total number of species of medicinal vascular plants and all the collected plant information is

shown in Table 7. Roots and rhizomes are the second most prevalent medical parts, accounting for 27.48% of the number of species. Flowers, branches and leaves, fruits and seeds account for 3.6%, 12.16%, 5.86% and 0.9%, respectively, with relatively few species.

Table 6 Different medicinal parts of medicinal vascular plants in FMNR

Medicinal part	No. species	Ratio/%
Whole herb	110	49.54
Root and rhizome	94	42.34

(to be continued)



Continued table 6

Medicinal part	No. species	Ratio/%
Flower	8	3.60
Leaf	28	12.61
Fruit and seed	15	6.76
Cortex	5	2.25
Wood Stem	9	4.05

Table 7 Collected plant resources in FMNR

No.	Families	Genera	Species	Scientific name
1	Styracaceae	<i>Styrax</i>	Yemoli	<i>Styrax japonicus</i> Sieb. et Zucc.
2	Octocarpaceae	<i>Alangium</i>	Bajiaofeng	<i>Alangium chinense</i> (Lour.) Harms
3	Liliaceae	<i>Myrtaceae</i>	Kuoyemaidong	<i>Liriope platyphylla</i> Wang. et Tang.
4	Liliaceae	<i>Marigold</i>	Baoduocao	<i>Disporum sessile</i> D. Don
5	Liliaceae	<i>Ophiopogon</i>	Maidong	<i>Ophiopogon japonicas</i> (Linn.f.) Ker-Gawl.
6	Liliaceae	<i>Asparagus</i>	Tianmendong	<i>Asparagus cochinchinensis</i> (Lour.) Merr.
7	Liliaceae	<i>Lilium</i>	Dalibaihe	<i>Lilium taliense</i> Franch.
8	Liliaceae	<i>Veratrum</i>	Heizililu	<i>Veratrum japonicum</i> (Baker) Loes. f.
9	Liliaceae	<i>Tricyrtis</i>	Youdiancao	<i>Tricyrtis macropoda</i> Miq.
10	Liliaceae	<i>Marigold</i>	Wanshouzhu	<i>Disporum cantoniense</i> Merr
11	Liliaceae	<i>Reineckea</i>	Jixiangcao	<i>Reineckea carnea</i> (Andr.) Kunth
12	Liliaceae	<i>Veratrum</i>	Lilu	<i>Veratrum nigrum</i> L.
13	Liliaceae	<i>Smilax</i>	Huadongbaqia	<i>Smilax sieboldii</i> Miq.
14	Liliaceae	<i>Polygonatum</i>	Duohuahuangjing	<i>Polygonatum cyrtoneura</i> Hua
15	Liliaceae	<i>Lilium</i>	Juandan	<i>Lilium lancifolium</i> Thunb.
16	Valerianaceae	<i>Patrinia</i>	Baihuabaijiang	<i>Patrinia villosa</i> (Thunb.) Juss.
17	Caprifoliaceae	<i>Valeriana</i>	Xiecao	<i>Valeriana officinalis</i> L.
18	Primulaceae	<i>Pearl cabbage</i>	Guoluhuang	<i>Lysimachia christinae</i> Hance
19	Primulaceae	<i>Pearl cabbage</i>	Luodimei	<i>Lysimachia paridiformis</i> Franch.
20	Primulaceae	<i>Pearl cabbage</i>	Yetouguoluhuang	<i>Lysimachia phyllocephala</i> Hand.-Mazz.
21	Caprifoliaceae	<i>Dipsacus</i>	Chuanxuduan	<i>Dipsacus asperoides</i> C. Y. Cheng et T. M. Ai
22	Lamiaceae	<i>Mentha</i>	Bohe	<i>Mentha haplocalyx</i> Briq.
23	Lamiaceae	<i>Prunella</i>	Xiakucao	<i>Prunella vulgaris</i> L.
24	Lamiaceae	<i>Paraphlomis</i>	Jiacaosu	<i>Paraphlomis</i> (Bl.) Prain
25	Lamiaceae	<i>Meehania</i>	Longtoucao	<i>Meehania henryi</i> (Hemsl.) Sun ex C. Y. Wu

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
26	Lamiaceae	<i>Pearl cabbage</i>	Zhenzhucai	<i>Pogostemon auricularius</i> (L.) Kassk.
27	Lamiaceae	<i>Clinopodium</i>	Fengluncai	<i>Clinopodium chinense</i> (Benth.) O. Ktze.
28	Lamiaceae	<i>Leonurus</i>	Yimucuo	<i>Leonurus artemisia</i> (Laur.) S.Y.Hu F
29	Euphorbiaceae	<i>Mallotus</i>	Yetong	<i>Mallotus japonicus</i> var. <i>floccosus</i>
30	Euphorbiaceae	<i>Euphorbia</i>	Hubeidaji	<i>Euphorbia hylonoma</i> Hand.-Mazz.
31	Euphorbiaceae	<i>Mallotus</i>	Cukangchai	<i>Mallotus philippensis</i> (Lam.) Muell.-Arg.
32	Euphorbiaceae	<i>Mallotus</i>	Shiyanfeng	<i>Mallotus repandus</i> (Willd.)Muell.Arg.
33	Euphorbiaceae	<i>Antidesma</i>	Wuyuecha	<i>Antidesma bunius</i> (L.) Spreng.
34	Aquifoliaceae	<i>Ilex</i>	Ciyedongqing	<i>Ilex bioritsensis</i> Hayata
35	Fabaceae	<i>Mountain locusts</i>	Emahuang	<i>Desmodium multiflorum</i> DC.
36	Fabaceae	<i>Genus Xyla</i>	Maji	<i>Indigofera pseudotinctoria</i> Matsum.
37	Fabaceae	<i>Rhinoceros spp</i>	Xichicaomuxi	<i>Melilotus dentate</i> (Waldst. et Kit.) Pers.
38	Fabaceae	<i>Cliff bean vine</i>	Xianghuayadouteng	<i>Millettia dielsiana</i> Harms
39	Fabaceae	<i>Hylodesmum</i>	Changbingshanmahuang	<i>Podocarpium podocarpum</i> (DC)Yang et Huang
40	Fabaceae	<i>Mimosa</i>	Hanxiucuo	<i>Mimosa pudica</i> Linn.
41	Fabaceae	<i>Lespedeza</i>	Meilihuzhizi	<i>Lespedeza formosa</i> (Vog.) Koehne
42	Fabaceae	<i>Dalbergia</i>	Tenghuangtan	<i>Dalbergia hancei</i> Benth.
43	Fabaceae	<i>Bauhinia</i>	Yangtjia	<i>Bauhinia purpurea</i> L.
44	Fabaceae	<i>Wisteria</i>	Ziteng	<i>Wisteria sinensis</i> (Sims) Sweet
45	Ericaceae	<i>Rhododendron</i>	Houtoudujuan	<i>Rhododendron simiarum</i> Hance
46	Ericaceae	<i>Rhododendron</i>	Gaoshandujuan	<i>Rhododendron lapponicum</i> (L.) Wahl.
47	Menispermaceae	<i>Cyclea</i>	Lunhuanteng	<i>Cyclea racemosa</i> Oliv.
48	Pteridaceae	<i>Pteris</i>	Wugongcao	<i>Pteris vittata</i> L.
49	Pteridaceae	<i>Pteris</i>	Fushifengweijue	<i>Pteris fauriei</i> Hieron
50	Pteridaceae	<i>Pteris</i>	Fengweijue	<i>Pteris cretica</i> L. var. <i>nervosa</i> (Thunb.)Ching et S.H.Wu
51	Balsaminaceae	<i>Impatiens</i>	Yazhicaofengxianhua	<i>Impatiens commelinoides</i>
52	Balsaminaceae	<i>Impatiens</i>	Huangjinfeng	<i>Impatiens sicutifer</i> Hook. f.
53	Balsaminaceae	<i>Impatiens</i>	Fanjingshanfengxianhua	<i>Impatiens fanjingshanica</i> Y.L.Chen
54	Lygodiaceae	<i>Lygodium</i>	Haijinsha	<i>Lygodium japonicum</i> (Thunb.) Sw.
55	Lygodiaceae	<i>Lygodium</i>	Dayehaijinsha	<i>Lygodium japonicum</i> (Thunb.) Sw.
56	Poaceae	<i>Lophatherum</i>	Danzhuye	<i>Lophatherum gracile</i>
57	Taxaceae	<i>Taxus</i>	Nanfanhongdoushan	<i>Taxus mairei</i> . var. <i>mairei</i>

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
58	Elaeagnaceae	<i>Elaeagnus</i>	Hutuizi	<i>Elaeagnus pungens</i> Thunb.
59	Cucurbitaceae	<i>Gynostemma</i>	Jiaogulan	<i>Gynostemma pentaphyllum</i> (Thunb.) Makino
60	Cucurbitaceae	<i>Hemsleya</i>	Xuedan	<i>Hemsleya chinensis</i> Cogn. ex Forbes et Hemsl.
61	Cucurbitaceae	<i>Trichosanthes</i>	Gualou	<i>Trichosanthes kirilowii</i> Maxim.
62	Saxifragaceae	<i>Trichosanthes</i>	Shuangbiangualou	<i>Trichosanthes rosthornii</i> Harms
63	Saxifragaceae	<i>Saxifraga</i>	Huercao	<i>Saxifraga stolonifera</i> Curt.
64	Euphorbiaceae	<i>Chrysosplenium</i>	Dayejinyao	<i>Chrysosplenium macrophyllum</i> Oliv.
65	Euphorbiaceae	<i>Hydrangea</i>	Lalianxiuqiu	<i>Hydrangea strigosa</i> Rehder
66	Euphorbiaceae	<i>Astilbe</i>	Luoxinfu	<i>Astilbe chinensis</i> (Maxim.) Franch. et Savat.
67	Euphorbiaceae	<i>Chrysosplenium</i>	Ribenjinyao	<i>Chrysosplenium japonicum</i> (Maxim.) Makino
68	Buxaceae	<i>Sarcococca</i>	Yeshanhua	<i>Sarcococca ruscifolia</i> Stapf
69	Buxaceae	<i>Sarcococca</i>	Yeshanhua	<i>Sarcococca longifolia</i>
70	Oleaceae	<i>Candida vine genus</i>	Nianzhuteng	<i>Alyxia fascicularis</i> Benth.
71	Zingiberaceae	<i>Alpinia</i>	Jianganfeng	<i>Alpinia jianganfeng</i> T.L.Wu
72	Zingiberaceae	<i>Globba</i>	Wuhuajiang	<i>Globba racemosa</i> Smith
73	Chloranthaceae	<i>Sarcandra</i>	Caoshanhu	<i>Sarcandra glabra</i> (Thunb.) Nakai
74	Chloranthaceae	<i>Chloranthus</i>	Duosuijinsulan	<i>Chloranthus multistachys</i> Pei
75	Thelypteridaceae	<i>Sacred fern</i>	Yulieshengjue	<i>Dictyocline wilfordii</i> (Hook) J. Smith
76	Violaceae	<i>Viola</i>	Maojincai	<i>Viola thomsonii</i> Oudem.
77	Stachyuraceae	<i>Stachyurus</i>	Zhongguojingjiehua	<i>Stachyurus chinensis</i> Franch.
78	Crassulaceae	<i>Sedum</i>	Aoyejingtian	<i>Sedum emarginatum</i> Migo
79	Crassulaceae	<i>Sedum</i>	Chuipencao	<i>Sedum sarmentosum</i> Bunge
80	Crassulaceae	<i>Sedum</i>	Ribenjingtian	<i>Sedum japonicum</i> Sieb. ex Miq.
81	Crassulaceae	<i>Rhodiola</i>	Yunnanhongjingtian	<i>Rhodiola yunnanensis</i> (Franch.) S. H. Fu
82	Crassulaceae	<i>Sedum</i>	Fojiacao	<i>Sedum lineare</i> Thunb.
83	Campanulaceae	<i>Campanumoea</i>	Jinqianbao	<i>Campanumoea javanica</i> Bl.
84	Campanulaceae	<i>Lobelia</i>	Shangengcai	<i>Lobelia sessilifolia</i> Lamb.
85	Campanulaceae	<i>Adenophora</i>	Shashen	<i>Adenophora stricta</i> Miq.
86	Campanulaceae	<i>Adenophora</i>	Xingyeshashen	<i>Adenophora humanensis</i> Nannf.
87	Campanulaceae	<i>Lobelia</i>	Tongchuiyudaicao	<i>Pratia nummularia</i> (Lam.) A. Br. et Ascher.
88	Campanulaceae	<i>Codonopsis</i>	Dangshen	<i>Codonopsis pilosula</i> (Franch.) Nannf.

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
89	Asteraceae	<i>Crassocephalum</i>	Gemingcai	<i>Gynura crepidioides</i> Benth.
90	Asteraceae	<i>Aster</i>	Sanmaiziwan	<i>Aster ageratoides</i> Turcz.
91	Asteraceae	<i>Senecio</i>	Qianliguang	<i>Senecio scandens</i> Buch-Ham. ex D. Don
92	Asteraceae	<i>Ichneumonia</i>	Yizhihuanghua	<i>Solidago decurrens</i> Lour.
93	Asteraceae	<i>Solidago</i>	Emeiqianliguang	<i>Senecio faberi</i>
94	Asteraceae	<i>Ligularia</i>	Tiyetuowu	<i>Ligularia fischeri</i> (Ledeb.) Turcz
95	Asteraceae	<i>Cirsium</i>	Fanjingji	<i>Cirsium fanjingshanense</i> Shih
96	Asteraceae	<i>Carpesium</i>	Tianmingjing	<i>Carpesium abrotanoides</i> L.
97	Asteraceae	<i>Ainsliaea</i>	Changsuituerfeng	<i>Ainsliaea henryi</i> Diels
98	Asteraceae	<i>Eupatorium</i>	Peilan	<i>Eupatorium fortunei</i> Turcz.
99	Asteraceae	<i>Anaphalis</i>	Huangxianxiangqing	<i>Anaphalis aureo-punctata</i> Lingelsh et Borza
100	Asteraceae	<i>Aster</i>	Yejuhua	<i>Aster sphaerotus</i> Ling
101	Asteraceae	<i>Cirsium</i>	Daji	<i>Cirsium japonicum</i> Fisch ex DC.
102	Asteraceae	<i>Eschenbachia</i>	Xiaopengcao	<i>Conyza canadensis</i> (L.) Cronq.
103	Asteraceae	<i>Artemisia</i>	Qinghao	<i>Artemisia carvifolia</i>
104	Curculaceae	<i>Selaginella</i>	Cuiyuncao	<i>Selaginella uncinata</i> (Desv.) Spring
105	Curculaceae	<i>Selaginella</i>	Shenlüjuanbai	<i>Selaginella doederleinii</i> Hieron.
106	Curculaceae	<i>Selaginella</i>	Shenggenjuanbai	<i>Selaginella doederleinii</i> Hieron.
107	Gesneriaceae	<i>Oreocharis</i>	Changbanmalingjutai	<i>Oreocharis auricula</i> (S. Moore) Clarke
108	Gesneriaceae	<i>Oreocharis</i>	Changbanmalingjutai	<i>Oreocharis aurea</i> Dunn
109	Gesneriaceae	<i>Briggsia</i>	Chuanecutongjutai	<i>Briggsia rosthornii</i> (Diels) Burt
110	Gesneriaceae	<i>Hemiboea</i>	Banshuojutai	<i>Hemiboea henryi</i> Clarke
111	Gesneriaceae	<i>Chirita</i>	Mahuangqi	<i>Chirita fimbrisejala</i> Hand.-Mazz.
112	Gesneriaceae	<i>Hemiboea</i>	Banshuojutai	<i>Hemiboea albiflora</i>
113	Orchidaceae	<i>Pleione</i>	Meilidusuanlan	<i>Pleione pleionoides</i>
114	Orchidaceae	<i>Goodyera</i>	Banyelan	<i>Goodyera schlechtendaliana</i> Rchb. f.
115	Lentibulariaceae	<i>Utricularia</i>	Erwacao	<i>Utricularia bifida</i> L.
116	Gleicheniaceae	<i>Diplopterygium</i>	Libai	<i>Hicriopteris glauca</i> (Thunb.) Ching
117	Gleicheniaceae	<i>Diplopterygium</i>	Guanglibai	<i>Diplopterygium laevissima</i> (Christ) Ching
118	Gleicheniaceae	<i>Dicranopteris</i>	Mangqi	<i>Dicranopteris dichotoma</i> (Thunb.) Berhn.
119	Polygonaceae	<i>Persicaria</i>	Touhualiao	<i>Polygonum capitatum</i> Buch.-Ham. ex D. Don
120	Polygonaceae	<i>Persicaria</i>	Quangengrenzhongcao	<i>Polygonum chinense</i> L.

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
121	Polygonaceae	<i>Pleuropterus</i>	Heshouwu	<i>Fallopia multiflora</i> (Thunb.) Harald
122	Polygonaceae	<i>Persicaria</i>	Huotanmu	<i>Polygonum chinense</i> L.
123	Polygonaceae	<i>Fagopyrum</i>	Jinqiaomai	<i>Fagopyrum dibotrys</i> (D. Don) Hara
124	Polygonaceae	<i>Persicaria</i>	Shuiliao	<i>Polygonum hydropiper</i> L.
125	Polygonaceae	<i>Persicaria</i>	Jiyeliao	<i>Polygonum thunbergii</i> Sieb. et Zucc.
126	Polygonaceae	<i>Persicaria</i>	Gangbangui	<i>Polygonum perfoliatum</i> L.
127	Polygonaceae	<i>Antenoron</i>	Duanmaojinxiancao	<i>Antenoron filiforme</i> var. <i>neofiliforme</i>
128	Polygonaceae	<i>Persicaria</i>	Suanmoyeliao	<i>Polygonum lapathifolium</i> L.
129	Polygonaceae	<i>Persicaria</i>	Xihualiao	<i>Polygonum dissitiflorum</i> Hemsl.
130	Dryopteridaceae	<i>Arachniodes</i>	Citoufuyeerjue	<i>Arachniodes exilis</i> (Hance) Ching
131	Dryopteridaceae	<i>Cyrtomium</i>	Dayuguanzhong	<i>Cyrtomium maximum</i> Ching et Shing ex Shing
132	Dryopteridaceae	<i>Dryopteris</i>	Guanzhong	<i>Cyrtomium fortunei</i> J. Sm.
133	Phyllostachycephalidae	<i>Plagiogyria</i>	Huadongliuzujue	<i>Plagiogyria japonica</i> Nakai
134	Onagraceae	<i>Epilobium</i>	Liuyecai	<i>Epilobium hirsutum</i> L.
135	Onagraceae	<i>Circaea</i>	Nanfangluzhucao	<i>Circaea mollis</i> S. et Z.
136	Gentianaceae	<i>Pterygocalyx</i>	Yie	<i>Pterygocalyx volubilis</i> Maxim.
137	Gentianaceae	<i>Tripterospermum</i>	Feixingcao	<i>Tripterospermum affine</i> (Wall.) H. Smith
138	Gentianaceae	<i>Swertia</i>	Zhangyacai	<i>Swertia bimaculata</i> f.
139	Gentianaceae	<i>Gentiana</i>	Linyelongdan	<i>Gentiana squarrosa</i> Ledeb.
140	Gentianaceae	<i>Gentiana</i>	Longdan	<i>Gentiana scabra</i> Bunge
141	Apocynaceae	<i>Ceropegia</i>	Diaodenghua	<i>Ceropegia trichantha</i> Hemsl.
142	Apocynaceae	<i>Gooseberry</i>	Erongteng	<i>Cynanchum chinense</i> R. Br.
143	Lamiaceae	<i>Callicarpa</i>	Hongzizhu	<i>Callicarpa rubella</i> Lindl. var. <i>rubella</i>
144	Lamiaceae	<i>Clerodendrum</i>	Choumudan	<i>Clerodendrum bungei</i> Steud.
145	Lamiaceae	<i>Callicarpa</i>	Tengzizhu	<i>Callicarpa peii</i>
146	Lamiaceae	<i>Premna</i>	Doufuchai	<i>Premna microphylla</i> Turcz.
147	Lamiaceae	<i>Vitex</i>	Huangjing	<i>Vitex negundo</i> L.
148	Aristolochiaceae	<i>Asarum</i>	Weihuaxixin	<i>Asarum caudigerum</i> Hance
149	Aristolochiaceae	<i>Asarum</i>	Xixin	<i>Asarum sieboldii</i> Miq.
150	Scrophulariaceae	<i>Buddleja</i>	Zuiyucao	<i>Buddleja lindleyana</i> Fortune
151	Coriariaceae	<i>Coriaria</i>	Masang	<i>Coriaria nepalensis</i> Wall.
152	Geranaceae	<i>Geranium</i>	Laoguancao	<i>Geranium wilfordii</i> Maxim.

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
153	Ranunculaceae	<i>Anemone</i>	Qiumudan	<i>Anemone hupehensis</i> var. <i>japonica</i>
154	Ranunculaceae	<i>Thalictrum</i>	Jianyetangsongcao	<i>Thalictrum acutifolium</i> (Hand.-Mazz.) Boivin
155	Ranunculaceae	<i>Thalictrum</i>	Huadongtangsongcao	<i>Thalictrum fortunei</i> S.Moore
156	Ranunculaceae	<i>Clematis</i>	Danyetiexianlian	<i>Clematis henryi</i> Oliv.
157	Ranunculaceae	<i>Dichocarpum</i>	Renziguo	<i>Dichocarpum sutchuenense</i>
158	Ranunculaceae	<i>Thalictrum</i>	Zhaowatangsongcao	<i>Thalictrum javanicum</i> Blum
159	Ranunculaceae	<i>Clematis</i>	Tiexianlian	<i>Clematis florida</i> Thunb.
160	Ranunculaceae	<i>Anemone</i>	Ezhangcao	<i>Anemone flaccida</i> Fr. Schmidt
161	Ranunculaceae	<i>Ranunculus</i>	Maogen	<i>Ranunculus japonicas</i> Thunb.
162	Ranunculaceae	<i>Anemone</i>	Dapowanhuahua	<i>Anemone hupehensis</i> Lemoine
163	Actinidiaceae	<i>Actinidia</i>	Mihoutao	<i>Actinidia chinensis</i> Planch
164	Actinidiaceae	<i>Actinidia</i>	Geyemihoutao	<i>Actinidia subricaulis</i> var. <i>Coriacea</i>
165	Actinidiaceae	<i>Actinidia</i>	Ruanzaomihoutao	<i>Actinidia arguta</i> (Sieb.et Zucc) Planch.ex Mip.
166	Actinidiaceae	<i>Actinidia</i>	Changyemihoutao	<i>Actinidia hemsleyana</i> Dunn
167	Schisandraceae	<i>Schisandra</i>	Huazhongwuweizi	<i>Schisandra sphenanthera</i>
168	Lardizabalaceae	<i>Stauntonia</i>	Yemugua	<i>Stauntonia chinensis</i> DC.
169	Lardizabalaceae	<i>Akebia</i>	Baimutong	<i>Akebia trifoliata</i> subsp. <i>australis</i>
170	Oleaceae	<i>Ligustrum</i>	Xiaoyenüzhen	<i>Ligustrum quihoui</i> Carr.
171	Oleaceae	<i>Ligustrum</i>	Changyenüzhen	<i>Ligustrum compactum</i> (Wall.ex G.Dor) Hook.f.
172	Oleaceae	<i>Ligustrum</i>	Xiaola	<i>Ligustrum sinense</i> Lour.
173	Equisetaceae	<i>Equisetum</i>	Jiejiecao	<i>Equisetum ramosissimum</i> Desf.
174	Vitaceae	<i>Vitis</i>	Xianchisheputao	<i>Ampelopsis grossedentata</i> (Hand-Mazz) W.T.wang
175	Vitaceae	<i>Parthenocissus</i>	Yiyedijin	<i>Parthenocissus dalzielii</i> Gagnep.
176	Vitaceae	<i>Pseudocayratia</i>	Baimaowulianmei	<i>Cayratia albifolia</i> C. L. Li.
177	Vitaceae	<i>Pseudocayratia</i>	Wulianmei	<i>Cayratia japonica</i> (Thunb.) Gagnep
178	Vitaceae	<i>Tetrastigma</i>	Yapateng	<i>Tetrastigma obtectum</i> (Wall.) Planch.
179	Sapindaceae	<i>Acer</i>	Sanjiaoqi	<i>Acer buergerianum</i> Miq.
180	Rubiaceae	<i>Paederia</i>	Jishiteng	<i>Paederia scandens</i> (Lour.) Merr.
181	Rubiaceae	<i>Ophiorrhiza</i>	Ribenshegencao	<i>Ophiorrhiza japonica</i> Bl.
182	Rubiaceae	<i>Ophiorrhiza</i>	Guangzhoushegencao	<i>Ophiorrhiza cantoniensis</i> Hacc
183	Rubiaceae	<i>Uncaria</i>	Dayegouteng	<i>Uncaria macrophylla</i> Wall.

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
184	Rubiaceae	<i>Rubia</i>	Zishen	<i>Rubia yunnanensis</i> Diels
185	Rubiaceae	<i>Morinda</i>	Yangjiaoteng	<i>Morinda umbellata</i> L. subsp. <i>obovata</i> Y. Z. Ruan
186	Rubiaceae	<i>Gardenia</i>	Zhizi	<i>Gardenia jasminoides</i> J. Ellis
187	Rubiaceae	<i>Lasianthus</i>	Wumaocuyemu	<i>Lasianthus bartii</i> (Fin. Et) Franch.
188	Rosaceae	<i>Rubus</i>	Chatianpao	<i>Rubus coreanus</i> Miq.
189	Rosaceae	<i>Rosa</i>	Jinyingzi	<i>Rosa laevigata</i> Michx
190	Rosaceae	<i>Agrimonia</i>	Longyacao	<i>Agrimonia pilosa</i> Ldb
191	Rosaceae	<i>Spiraea</i>	Honghuaxiuxianju	<i>Spiraea japonica</i>
192	Rosaceae	<i>Rosa</i>	Cili	<i>Rosa roxburghii</i> Tratt.
193	Rosaceae	<i>Rubus</i>	Shanmei	<i>Rubus corchorifolius</i> L.f.
194	Solanaceae	<i>Atropa</i>	Dianqie	<i>Atropa belladonna</i> L.
195	Begoniaceae	<i>Begonia</i>	Zhonghuaqiuhaitang	<i>Begonia grandis</i> subsp. <i>sinensis</i>
196	Begoniaceae	<i>Begonia</i>	Qiuhaitang	<i>Begonia grandis</i> Dry
197	Caprifoliaceae	<i>Lonicera</i>	Danhongrendong	<i>Lonicera acuminata</i> Wall.
198	Caprifoliaceae	<i>Zabelia</i>	Liudaomu	<i>Abelia biflora</i> Turcz.
199	Caprifoliaceae	<i>Lonicera</i>	Guxianrendong	<i>Lonicera hypoglauca</i> Miq.
200	Saururaceae	<i>Houttuynia</i>	Jicai	<i>Houttuynia cordata</i> Thunb.
201	Araliaceae	<i>Hydrocotyle</i>	Hongmaticao	<i>Hydrocotyle nepalensis</i> Hk.
202	Apiaceae	<i>Cryptotaenia</i>	Yaerqin	<i>Cryptotaenia japonica</i> Hassk.
203	Apiaceae	<i>Oenanthe</i>	Shuiqin	<i>Oenanthe javanica</i> (Blume) DC
204	Apiaceae	<i>Sanicula</i>	Biandoucai	<i>Sanicula chinensis</i> Bunge
205	Apiaceae	<i>Angelica</i>	Dayedanggui	<i>Angelica megaphylla</i> Diels
206	Apiaceae	<i>Oenanthe</i>	Zhonghuashuiqin	<i>Oenanthe sinensis</i> Dunn
207	Apiaceae	Account Ginseng Genus	Mingdangshen	<i>Changium smyrnioides</i> Wolff.
208	Apiaceae	<i>Peucedanum</i>	Qianhu	<i>Peucedanum praeruptorum</i> Dunn
209	Loranthaceae	<i>Scurrula</i>	Honghuajisheng	<i>Scurrula parasitica</i> L.
210	Moraceae	<i>Ficus</i>	Tianxianguo	<i>Ficus erecta</i> var. <i>beecheana</i>
211	Moraceae	<i>Ficus</i>	Zhenzhulian	<i>Ficus sarmentosa</i> var. <i>henryi</i>
212	Moraceae	<i>Ficus</i>	Jianyerong	<i>Ficus henryi</i> Warb. ex Diels
213	Sauraceae	<i>Salix</i>	Suocao	<i>Cyperus rotundus</i> L.
214	Theaceae	<i>Camellia</i>	Youcha	<i>Camellia oleifera</i> Abel

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
215	Cornaceae	<i>Cornus</i>	Dengtaishu	<i>Bothrocaryum controversum</i> (Hemsl.) Pojark.
216	Phytolaccaceae	<i>Phytolacca</i>	Meizhoushanglu	<i>Phytolacca Americana</i> L.
217	Lycopodiaceae	<i>Lycopodium</i>	Shisong	<i>Lycopodium japonicum</i> Thunb. ex Murray
218	Rhamnaceae	<i>Rhamnus</i>	Donglü	<i>Rhamnus utilis</i> Decne.
219	Rhamnaceae	<i>Berchemia</i>	Gulinggouercha	<i>Berchemia kulingensis</i> Schneid
220	Dioscoreaceae	<i>Dioscorea</i>	Ribenshuyu	<i>Dioscorea japonica</i> Thunb.
221	Dioscoreaceae	<i>Dioscorea</i>	Shugen	<i>Dioscorea cirrhosa</i> Lour.
222	Dioscoreaceae	<i>Dioscorea</i>	Shuyu	<i>Dioscorea opposita</i> Thunb.
223	Dioscoreaceae	<i>Dioscorea</i>	Ribenshuyu	<i>Dioscorea deltoidea</i>
224	Polypodiaceae	<i>Pyrrosia</i>	Shiwei	<i>Pyrrosia lingua</i> (Thunb.) Farwell
225	Polypodiaceae	<i>Lepisorus</i>	Wawei	<i>Lepisorus thunbergianus</i>
226	Polypodiaceae	<i>Arthromeris</i>	Jiezhijue	<i>Arthromeris lehmanni</i> (Mett.) Ching
227	Polypodiaceae	<i>Neolepisorus</i>	Dunjue	<i>Neolepisorus ovatus</i> (Bedd.) Ching
228	Polypodiaceae	<i>Neolepisorus</i>	Jiyedunjue	<i>Neolepisorus dengii</i> form. <i>hastatus</i>
229	Polypodiaceae	<i>Pyrrosia</i>	Lushanshiwei	<i>Pyrrosia sheareri</i> (Bak.) Ching.
230	Polypodiaceae	<i>Hydrokellus</i>	Youshuilonggu	<i>Polypodiodes amoena</i> (Wall.ex Mett.) Ching
231	Polypodiaceae	<i>Hydrokellus</i>	Youshuilonggu	<i>Goniophlebium lachnopus</i>
232	Polypodiaceae	<i>Microsorium</i>	Jiangnanxingjue	<i>Microsorium fortunei</i> (T.Moore) Ching
233	Clusiaceae	<i>Hypericum</i>	Diercao	<i>Hypericum japonicum</i> Thunb. ex Murray
234	Clusiaceae	<i>Hypericum</i>	Mixianxiaolianqiao	<i>Hypericum seniavinii</i> Maxim
235	Clusiaceae	<i>Hypericum</i>	Yuanbaocao	<i>Hypericum sampsonii</i> Hance
236	Athyriaceae	<i>Dryoathyrium</i>	Huazhongjiejue	<i>Dryoathyrium okuboanum</i> (Makino) Ching
237	Athyriaceae	<i>Diplazium</i>	Danyeshuanggaijue	<i>Diplazium subsinuatum</i>
238	Athyriaceae	<i>Diplazium</i>	Danyeshuanggaijue	<i>Diplazium pinfaense</i>
239	Araceae	<i>Amorphophallus</i>	Moyu	<i>Amorphophallus konjac</i> K.Koch
240	Araceae	<i>Pinellia</i>	Dishuizhu	<i>Pinellia integrifolia</i> N.E.Brown
241	Araceae	<i>Acorus</i>	Shichangpu	<i>Acorus tatarinowii</i> Scho
242	Araceae	<i>Arisaema</i>	Dengtailian	<i>Arisaema sikokianum</i> . var. <i>serratum</i>
243	Araceae	<i>Acorus</i>	Changpu	<i>Acorus calamus</i> L.
244	Araceae	<i>Arisaema</i>	Xiangnanxing	<i>Arisaema elephas</i> Buchet
245	Aspleniaceae	<i>Asplenium</i>	Tiejiaojue	<i>Asplenium trichomanes</i> L.
246	Aspleniaceae	<i>Asplenium</i>	Daoguatiejiaojue	<i>Asplenium normale</i> Don

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
247	Aspleniaceae	<i>Asplenium</i>	Changyeticjiaoju	<i>Asplenium prolongatum</i> Hook.
248	Aspleniaceae	<i>Asplenium</i>	Tiexianju	<i>Adiantum Capillus-veneris</i> L.
249	Celastraceae	<i>Euonymus</i>	Xinanweimao	<i>Euonymus hamiltonianus</i> Wall.ex Roxb.
250	Blechnaceae	<i>Genus Canine Spine Fern</i>	Danyagoujijue	<i>Woodwardia unigemmata</i> (Makino) Nakai
251	Blechnaceae	<i>Genus Canine Spine Fern</i>	Goujijue	<i>Woodwardia japonica</i> (L. f.) Sm.
252	Araliaceae	<i>Heptapleurum</i>	Ezhangchai	<i>Schefflera octophylla</i> (Lour.) Harms
253	Araliaceae	<i>Hedera</i>	Changchunteng	<i>Hedera nepalensis</i> var. <i>sinensis</i>
254	Araliaceae	<i>Eleutherococcus</i>	Baile	<i>Acanthopanax trifoliatum</i> (L.) Merr.
255	Araliaceae	<i>Eleutherococcus</i>	Wuzhuyuyewujia	<i>Acanthopanax evodiaefolius</i> Franch.
256	Amaranthaceae	<i>Achyranthes</i>	Niuxi	<i>Achyranthes bidentata</i> Blume.
257	Berberidaceae	<i>Epimedium</i>	Yinyanghuo	<i>Epimedium brevicornu</i> Maxim.
258	Berberidaceae	<i>Mahonia</i>	Huananshidagonglao	<i>Mahonia japonica</i> (Thunb.) DC.
259	Berberidaceae	<i>Mahonia</i>	Kuoyeshidagonglao	<i>Mahonia bealei</i> (Fort.) Carr.
260	Scrophulariaceae	<i>Mazus</i>	Dandaozicai	<i>Mazus stachydifolius</i> (Turcz.) Maxim.
261	Scrophulariaceae	<i>Matricaria</i>	Mucuo	<i>Lindernia crustacea</i> (L.) F. Muell
262	Scrophulariaceae	<i>Erythranthe</i>	Gousuanjiang	<i>Mimulus tenellus</i> Bunge
263	Urticaceae	<i>Pilea</i>	Huayelengshuihua	<i>Pilea cadierei</i> Gagnep.
264	Urticaceae	<i>Elatostema</i>	Lushanlouticao	<i>Elatostema stewardii</i> Merr.
265	Urticaceae	<i>Boehmeria</i>	Xiaochima	<i>Boehmeria spicata</i> (Thunb.) Thunb.
266	Urticaceae	<i>Elatostema</i>	Louticao	<i>Elatostema involucratum</i> Franch.et Savat.
267	Urticaceae	<i>Pilea</i>	Cuchilengshuihua	<i>Pilea sinofasciata</i> C.J.Chen
268	Commelinaceae	<i>Pollia</i>	Duruo	<i>Pollia japonica</i> Thunb.
269	Commelinaceae	<i>Commelina</i>	Yazhicao	<i>Commelina communis</i> L.
270	Melastomataceae	<i>Sarcopyramis</i>	Rousuicao	<i>Sarcopyramis bodinieri</i> Levl. et. Van.
271	Melastomataceae	<i>Sarcopyramis</i>	Dongfangrousuicao	<i>Sarcopyramis bodinieri</i> . var. <i>delicate</i>
272	Papaveraceae	<i>Eomecon</i>	Xueshuicao	<i>Eomecon chionantha</i> Hance
273	Papaveraceae	<i>Macleaya</i>	Boluohui	<i>Macleaya cordata</i> (Willd.) R. Br.
274	Rutaceae	<i>Zanthoxylum</i>	Yankehuajiao	<i>Zanthoxylum dissitum</i> Hemsl.
275	Rutaceae	<i>Zanthoxylum</i>	Yehuajiao	<i>Zanthoxylum simulans</i> Hance
276	Lauraceae	<i>Lindera</i>	Wuyao	<i>Lindera aggregata</i> (Sims) Kosterm.
277	Chinese Fern Family	<i>Onychium</i>	Yeziweiijinfenju	<i>Onychium japonicum</i> (Thunb.) Kze.

(to be continued)



Continued table 7

No.	Families	Genera	Species	Scientific name
278	Chinese Fern Family	<i>Onychium</i>	Baoshilian	<i>Lepidogrammitis drymoglossoides</i> (Baker) Ching
279	Boraginaceae	<i>Cynoglossum</i>	Liulicao	<i>Cynoglossum furcatum</i> (Vahl) Thunb.
280	Myrsinaceae	<i>Ardisia</i>	Zijinniu	<i>Ardisia japonica</i> (Thunb) Blume
281	Myrsinaceae	<i>Embelia</i>	Wangmaisuantengzi	<i>Embelia rudis</i> Hand.-Mazz.
282	Myrsinaceae	<i>Ardisia</i>	Zoumatai	<i>Ardisia gigantifolia</i> Stapf
283	Myrsinaceae	<i>Maesa</i>	Dujingshan	<i>Maesa japonica</i> (Thunb.) Moritzi.
284	Oxalidaceae	<i>Oxalis</i>	Cujiangcao	<i>Oxalis corniculata</i> L.

4 Discussion

There are many precious plant resources preserved in FMNR. The preliminary survey and diversity analysis of vascular plant resources in FMNR show that there are 284 species of vascular plants belonging to 93 families and 205 genera in FMNR. In terms of plant species, angiosperms dominate in the Nature Reserve because of their strong adaptability to the environment, while gymnosperms are rarely distributed. In terms of plant families, the main families are Liliaceae, Leguminosae, Compositae, Salicaceae and Ranunculaceae. The main genera are *Polygonum*, *Dioscillus*, *Actinidia*, *Sedum* and *Thalictrum*. The reason for this may be related to their superior reproductive structure and strong environmental adaptability. Herbaceous and shrubby plant types are predominant, and perennial herbs are the most widely distributed. Their low-lying and densely clustered growth patterns allow them to adapt well to unfavorable conditions, such as short growing period. In addition, there are abundant resources of vascular plants with medicinal value in FMNR. According to the survey, there are 222 species of vascular plants with medicinal value in 61 families and 158 genera in the Nature Reserve. This further indicates that the vascular plants in FMNR are

important sources of medicinal resources. In terms of medicinal parts, whole herbs are the most abundant, followed by roots and rhizomes. The favorable geographical conditions provide an ideal environment for the growth of whole herbs.

5 Conclusion

FMNR, as a national nature reserve, is rich in plant resources. However, due to the development of tourism, the ecosystem has suffered some man-made damage. Therefore, it is necessary to strengthen the exploitation of plant resources while taking into account the protection of resources and environment in order to achieve sustainable development. Therefore, the following suggestions are made. Firstly, scientific research on the plant resources of FMNR should be strengthened by increasing support for scientific researchers and further carrying out basic research such as chemistry and biology to comprehensively evaluate the exploitation value of plant resources. Secondly, protection of the FMNR should be strengthened too, by using ecological restoration techniques to centralize the treatment of already degraded grasslands, strengthening infrastructure construction to reduce human damage, and increasing publicity to raise people's awareness of ecological protection.



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