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REVIEW ARTICLE

Biodiversity conservation evaluation and planning on the western slope of Cangshan Mountains

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ABSTRACT

Taking the west slope of Cangshan Mountain in Yangbi County, Dali as the research site, on the basis of investigating the local natural geographical conditions, topography and biodiversity status of Cangshan Mountain, the CAP protection action planning method was adopted, and the priority protection objects were determined to be native forest vegetation, rare and endangered flora and fauna, alpine vertical ecosystems, hard-leaf evergreen broad-leaved forests and cold-tempered coniferous forests; The main threat factors were commercial collection, tourism development and overgrazing. Biodiversity conservation on the western slope of Cangshan Mountain should take species as "point", regional boundary as "line", ecosystem and landscape system as "plane", so as to realize the overall planning structure system combining "point—line—plane", which can be divided into conservation core area, buffer zone and experimental area. The results can provide a reference for biodiversity conservation on the western slope of Cangshan Mountain.

Keywords: CAP Protection Action; Protected Object; Threat Factor; Overall Planning Layout; Cangshan Mountain

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1. Introduction

Yunnan is one of the world's top ten biodiversity hotspots and the core region of the Eastern Himalayas, with the largest number of species and endemic groups in China. And northwest Yunnan is one of the areas with the richest biodiversity in China and even in the world, and is also a vulnerable area in Yunnan's ecological environment[1-3]. Cangshan mountain is located at the junction of Dali, Eryuan and Yangbi, in northwest Yunnan province. It is an important part of Dali national key scenic spot and a famous mountain in the middle of Hengduan Mountain range. The western slope of Cangshan Mountain is located in Yangbi River, Yangbi County, and is an important part of Cangshan Erhai National Nature Reserve and scenic spot. Vegetation types are diverse and biodiversity is extremely rich and unique, which is mainly a land ecosystem of forest, grass and irrigation cade broad-leaved forest represented by rhododendron. Throughout the Dali Cangshan-Erhai Nature Reserves and biodiversity in Yunnan province, northwest Yunnan biodiversity conservation domain are in a very important position, but due to the regional economic development lag behind, fragile natural ecological system, to protect the biodiversity in this area, it's of great significance to implement the strategy of sustainable development of Dali prefecture, Yunnan province.

Experts from the United Nations Development Programme (UNDP) estimate that about 200 of the 2,300 species of wild plants on the

Cangshan Seed Plant List are no longer extant, and a large number of plants are endangered or threatened, with at least five species of plants lost each year in recent years[4]. Some studies have investigated the current status of biodiversity in Cangshan Mountain, and found that the area has the characteristics of rich animal and plant species, diverse vegetation types, ancient flora origin, complex geographical composition, and numerous endemic species, which put forward unreasonable economic activities, overtourism development, forest fire hazards and serious biological invasions, which constitute the main threat to biodiversity in the area, and put forward corresponding conservation measures[5,6]. Therefore, it is imperative to implement biodiversity conservation planning in the region, especially the determination of priority conservation objects and threat factors, and the overall planning and layout.

To sum up, in order to scientifically and reasonably protect the biodiversity of western slope of Cangshan mountain, this paper covers the scope of biodiversity conservation planning within the western slope of Cangshan Mountain, Yangbi County, Dali Bai Autonomous Prefecture, with a protected area of 20,610 hm^2. On the basis of fully understanding and controlling the present situation of biological diversity in Cangshan reserve, it is necessary to determine the priority protection objects, protected areas and main threat factors, and to put forward the reasonable layout structure system and zoning of biodiversity protection planning, so as to provide reference for further carrying out biodiversity protection in this area.

2. Research methods

There are two ways to prepare biodiversity conservation planning: species-centered protection planning approach; the former emphasizes the protection of endangered species itself, while the latter emphasizes the overall protection of scenic landscape system and natural land, and tries to realize the protection of biodiversity by protecting the landscape diversity of scenic spots[7]. Based on the two methods, scholars combine the spatial hierarchy and spatial location and pattern of biodiversity, and scientifically detail the spatial hierarchy relationship of biodiversity, and put forward the biological diversity protection approaches and measures suitable for Fuzhou Gushan scenic spots[8]. Some scholars have also carried out relevant protection of ecological diversity in Qilian Mountain from the perspective of landscape diversity, ecosystem diversity and species diversity research[9]. Other scholars have applied the principle of landscape ecology to urban biodiversity protection, pointing out that urban green space system structure and urban green space control planning are the main ways to realize urban biodiversity[10].

This plan adopts the Conservation Action Planning (CAP), which is a logical regional protection strategy developed by scientists of the Nature Conservancy (TNC) and other international environmental protection after long-term practice[11]. This method is widely used in the resource management of nature reserves and other types of protected areas. It is a protection planning method that follows the project management process and helps protect workers to focus on key protection objects and key threat factors. CAP mainly includes 4 processes: (1) determine priority protection objects according to the importance; (2) threat factor analysis of identified protection objects; (3) develop protection strategies for protection objects to improve their living conditions and reduce threats; (4) In the process of protection, a dynamic effect evaluation is carried out, and on the basis of the evaluation, each link of the whole process is adaptively adjusted. It's an adaptive management framework[12-14]. CAP was introduced into China by TNC around 2000. The principles and methods of CAP were adopted in its northwestern Yunnan project area (including Laojun Mountain in Lijiang), and in cooperation with relevant protected areas, the Conservation action plan for more than 10 protected areas or national parks, including Shangri-La Grand Canyon, Gaoligong Mountain, Beijing Songshan Mountain, Shanghai Chongming Dongtan Bird National Nature Reserve, and the Rare and Endemic Fish Reserve in the upper reaches of the Yangtze River[15,16]. At the same time, some scholars have used this method to protect wetland parks and site parks[17,18]. Among them, some scholars use the analysis and evaluation of threat factors to guide the planning of urban plant

diversity construction[19].

The specific methods of this study are divided into two stages: early data collection (mainly including literature review) and field investigation. After sorting out the literature on the location of western slope, biodiversity distribution, endangered species habitat, and then conducting a field survey of western mountain, the investigation group was composed of 10 college students with biological diversity protection experience (mainly biological diversity protection, plant taxonomy, animal taxonomy, population ecology). After that, experts were rated by 15 experts (including 10 survey members, and 5 permanent work and management personnel in the protected areas, the same below) based on the information collected above and the annual work experience in biodiversity protection. It is mainly to sort out the threat degree of each protection object, filter out clear priority protection targets and main threat factors, so as to provide reference for the formulation of partition and protection strategies for further protection planning.

3. Results and analysis

3.1 Nature of the reserve

Western slope of Cangshan Mountain is a representative, typical and complete biological community and non-biological environment of central Asia, and has a distinct vertical distribution band spectrum (from the foothill to the top of the mountain has three vertical climatic zones, including subtropical, warm temperate and cold temperate). At the same time, there are many various vegetation types that transition from south Asian to alpine ice desert belt[20]. The special geographical location, geological geomorphology and climatic conditions make the western slope of Cangshan become the intersection and transition zone of north and south biology, and the distribution and differentiation center of various organisms is one of the regions with rich biodiversity. It can be used as the basic law and environmental monitoring site of natural processes in the north and south of the country, as well as the base of natural resources, genetic genes, and breeding of precious and rare plants and animals. Therefore, according to the location environment, natural environment and resource environment of the Cangshan Mountain Slope Nature Reserve, combined with the needs of the social environment, the nature of the nature is determined as: to protect the diverse ecosystems and rare animals and plants, and to maintain the naturalness, biodiversity, typicality, integrity and maintenance of ecological balance in the area for the purpose of the purpose, set species protection, water source protection, ecological protection, scientific research, science education, eco-tourism and other multi-functional integrated nature reserve.

3.2 Establishment of the object of protection

According to CAP's approach, the preservation of species representativeness and persistence is the two main objectives of protected areas[21]. Considering the importance and the process of being threatened, the principle of protecting the integrity and stability of the ecosystem in the region is to be taken as the criterion for selection, and the selection criteria are the severity of the degree of threat, whether it is the habitat or growth site of rare and endangered animals and plants, and the unique biodiversity landscape characteristics representing the western slope of Cangshan Mountain. The object of protection is established from three levels: species, ecosystem and vegetation.

3.2.1 Native forest vegetation

Focus on the protection of native forest vegetation, including secondary forests, shrubs and secondary bare land, which are the stages of vegetation succession and must be strictly protected. According to the survey, the natural vegetation below 2,500 m above sea level on the western slope has suffered from different degrees of damage. The semi-humid evergreen broad-leaved forest on the western slope is also preserved in small areas, and the large areas are distributed in *Pinus yunnanensis* forests that are closely related to its succession. Locally damaged areas, warm and warm shrublands or savanna slopes.

Native forest vegetation is the most precious natural heritage and gene bank of the Cangshan west slope biodiversity reserve, which contains rich germplasm resources and is also an indispensable

material foundation for gardens, forestry, agriculture, etc. Effective protection of it is one of the important tasks of biodiversity conservation, and the use of local protection is an effective conservation measure, eliminating the bare land and barren mountains in the protected area, and gradually restoring the vegetation with zonal native forest belt structure, so that the forest ecosystem has entered a virtuous circle, and the biological reproduction and rest areas have been significantly improved. At the same time, special attention is paid to the construction of shrubs and ground cover plants, and the function of soil conservation and slope protection in the protected area is strengthened to avoid and reduce soil erosion.

3.2.2 Alpine vertical ecosystem

Alpine vertical ecosystem refers to alpine shrubland, alpine meadows, and alpine flowing rocky beaches distributed at an altitude of more than 4,000 m. It represents the unique biodiversity landscape characteristics of the western slope of Cangshan Mountain, and is the most unique area of the western slope of Cangshan Mountain. The western slope of Cangshan Mountain belongs to the alpine mountainous area, and several peaks in the main peak area are above 4,000 m above sea level, which has the conditions of the limit height of the altitude distribution of native forest tree species. Therefore, the vertical differentiation of mountain vegetation zones is obvious and relatively complete. With the continuous increase of altitude, the coniferous forest gradually transitions from warm and temperate coniferous forests in the horizontal zone (*Pinus yunnanensis*, *Pinus armandii*, Yunnan *Keteleeria fortunei* forest, etc.) to warm coniferous forest (hemlock coniferous and broad-leaved mixed forest) and cold temperate coniferous forest (*Abies* forest), and the broad-leaved forest gradually transitions from the semi-humid evergreen broad- leaved forest in the horizontal zone (*Castanopsis delavayi*, *Castanopsis orthacantha*, *Lithocarpus dealbatus*, *Cyclobalanopsis glaucoides*, *Cyclobalanopsis delavayi* forest, etc.) to the wet green broad-leaved forest in the Zhongshan zone (dominated by *Lithocarpus variolosus*) and the cold warm hard-leaved evergreen broad-leaved forest in the subalpine area (dominated by *Quercus guyavifolia*). Until the tree species disappears, native alpine rhododendron shrubs or alpine meadows appear.

3.2.3 Forest ecosystems

The destruction of ecosystem diversity will lead to the loss of species diversity and genetic diversity within the system, causing many of these organisms to lose their habitat and disappear, so they are listed as protected objects. The main vegetation on the western slope of Cangshan was initially divided into 9 vegetation types, 13 vegetation subtypes, and 21 biomes[22]. The vertical band spectrum of the western slope includes: semi-humid evergreen broad-leaved forest, Yunnan pine forest belt (altitude 2,000–2,900 m), the main vegetation types are *Cyclobalanopsis delavayi* forest, *Pinus yunnanensis* forest, *Rhododendron* shrubland, *Arundinella setosa* grass, *Fiddlehead* grass, etc.; *Tsuga* forest, montane moist evergreen broad-leaved forest (altitude 2,950–3,350 m), the main vegetation types are *Rhododendron* shrubland, *Tsuga* forest, *Fargesia* forest and *Lithocarpus variolosus* forest; *Abies* forest belt (altitude 3,350–3,560 m), the main vegetation types are *Abies*, Quercus semecarpifolia forest, *Rhododendron* shrubland, *Fargesia* forest, etc.; *Rhododendron* shrubland (altitude 3,560–3,700 m), the main vegetation types are *Rhododendron taliense* shrubland, *Rhododendron haematodes* shrubland; Alpine meadow belt (altitude 3,700–4,100 m), the main vegetation types are *Kobresia royleana* meadows and *Festuca* meadows[20,22].

Among the main vegetation types on the western slope of Cangshan Mountain, the hard-leaf evergreen broad-leaved forest in the subalpine zone has become a germinating shrub due to human destruction, and is distributed on the sunny slopes with poor standing conditions. The level of threat is the most severe. Cold temperate coniferous forests have a certain area distribution in the upper part of the mountain. Due to the influence of geographical location and topographic conditions, there is only one species of *Abies delavayi* in the *Abies* and *Picea*, and no positive tree species common after such deforestation in northwest Yunnan—*Larix potaninii* were found in the survey. Cold and tem-

perate coniferous forests are concentrated in the main peak area of the eastern slope of Cangshan Mountain, because the peak wind is strong and the climate is harsh, which is replaced by *Sabina recurva* that are more drought-resistant and wind-resistant, forming a small sparse forest. *Abies delavay* after a long period of natural succession, at present, is in a state of apical community, forming a relatively stable forest type. Because it is located at a high altitude, the proportion of forest stand in the middle and over-mature forests is large, resulting in serious disease and rot, which poses a certain threat to the forest ecosystem[20]. Other vegetation on the western slope of Cangshan Mountain, such as the semi-humid evergreen broad-leaved forest belt, moist evergreen broad-leaved forest in Zhongshan belt, and mixed coniferous and broad-leaved forest of hemlock in the upper part of Zhongshan Mountain, have a certain area preserved on the west slope. Although there are also different degrees of man-made damage, the degree of threat and impact is relatively small compared to the former two.

Therefore, due to the great degree of threat of hard-leaved evergreen broad-leaved forests and cold-temperate coniferous forests, it directly affects the integrity of the forest ecosystem on the western slopes of Cangshan Mountain, and it is listed as a key protection object.

3.2.4 Rare and endangered protected plants

The flora of the western slope of Cangshan belongs to the pan-Arctic alpine flora and the Flora of the Chinese Himalayas, and belongs to one of the rich alpine floras in the world. The superior natural environment and special geographical location have bred a rich plant population and a variety of vegetation types, because it is a low-latitude subtropical region of the high mountains, the natural environment is complex, the species density is large, there are more rare and endangered plant species.

Cangshan is included in the List of Rare and Endangered Plants of China with 21 species[22,23], and in the survey, it was found that there are 12 species on the western slope of Cangshan Mountain, belonging to 11 families and 12 genera, accounting for 0% of the total number of floras in Cangshan 0.47%. The western slope of Cangshan Mountain is listed in the List of National Key Protected Wild Plants (First Batch)[24] with 1 species of fern and 7 species of angiosperms, and 1 species of national key protection and 7 species of second-level key protected plants (**Table 1**). According to the known plants list, there are 47 species of orchids on the western slopes of Cangshan, all of which are protected species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)[25].

Table 1. Wild plants under national key protection on the western slopes of Cangshan Mountain and their distribution

Species name	Section	Distribution	Protection level
Taxus yunnanensis	Yew family	Altitude 2,000–3,500 m, wet evergreen broad-leaved forest in Zhongshan, hemlock forest	One
Tricholoma matsutake	White mushroom family	Evergreen broad-leaved forest above 2,500 m above sea level	Two
Toona ciliata	Meliaceae	West Slope	Two
Craigia yunnanensis	Linden family	The altitude is around 2,200 m	Two
Skapanthus oreophilus	Lamiaceae	Altitude 2,700–3,100 m, Yunnan pine forest	Two
Tetracentron sinense	Aquacarinaceae	Altitude 2,700–2,900 m, wet evergreen broad-leaved forest in Zhongshan	Two
Neocheiropteris palmatopedata	Hydrogalaceae	2,000 m above sea level, semi-humid evergreen broad-leaved forest	Two
Fagopyrum dibotrys	Polygonaceae	The altitude is 2,200 m, in the forest clearing	Two
Magnolia wilsonii	Magnoliaceae	2,700 m above sea level, evergreen broad-leaved forest	Two

Rare and endangered plants on the western slope of Cangshan mountain are characterized by a wide distribution, and in terms of vertical distribution, the survey found that there are rare and endangered plants in the range from the foot of the mountain to 4,000 m below 4,000 m. In terms of its number, because the western slope of Cangshan is listed as a national nature reserve, coupled with the high mountainous terrain of the western slope itself; Species above 3,000 m are well protected, and the population number has a certain scale, but the species with higher economic value in the left and right

low-altitude areas of the western slope of 2,000 m, such as *Dendrobium candidum*, *Toona ciliata*, etc. have decreased sharply due to human over-mining, such as black knotweed has not been seen for many years, and some species distributed at low altitudes such as *Leucomeris decora*, collar spring wood (*Eupelea pleiosperum*) *et al.* are also decreasing year by year due to the serious destruction of habitats and the difficulty of population renewal.

There are about 433 species of animals in the West Slope Reserve, of which 285 are higher animals (82 species of mammals, 170 species of birds, 33 species of fish) and 148 species of lower animals. There are 26 species of national first- and second-level protected animals (5 species of first-class protected animals and 21 second-level protected animals), which belong to 16 families (**Table 2**). Amphibians, reptiles and insects were not surveyed. Due to the widespread indiscriminate hunting of animals in the past, tigers, leopards, red deer and other mammals that once inhabited the Cangshan Mountains are now difficult to find, and white-bellied golden pheasants, pangolins, and red pandas have been hunted and killed in large quantities in the past, and now the number is also rare.

Table 2. Cangshan national protected rare and endangered animal species

Species name	Section name	Protection level	Species name	Section name	Protection level
Panthera pardus	Feloidea Pantherinae	One	Pseudois nayaur	Bovidae	Two
Neofelis nebulosa	Feloidea Pantherinae	One	Capricornis sumatraensis	Bovidae	Two
Macaca assamensis	Cercopithecidae	One	Cervus unicolor	Cervoidea	Two
Budorcas taxicolor	Bovidae Caprinae	One	Manis pentadactyla	Lepidoptera	Two
Syrmaticus humiae	Phasianidae	One	Ratufa bicolor	Oriental giant squirrel	Two
Ailurus fulgens	Procyonidae	Two	Felis manul	Feloidea	Two
Felis temmincki	Feloidea Felinae	Two	Psittacula himalayana	Parrotidae	Two
Viverra zibetha	Viverridae	Two	Chrysolophus amherstiae	Phasianidae	Two
Viverricula indica	Viverridae	Two	Elanus caeruleus	Accipitridae Elaninae	Two
Felis chaus	Feloidea Felinae	Two	Falco tinnunculus	Falconidae	Two
Macaca mulatta	Cercopithecidae	Two	Psittacula alexandri	Parrotidae	Two
Ursus thibetanus	Ursidae	Two	Glaucidium brodiei	Strigidae	Two
Naemorhedus goral	Bovidae Caprinae	Two	Schizothorax taliensis	Cyprinidae	Two

3.3 Threat factor analysis

Based on the opinions of experts, protected area staff and management units involved in this planning field survey, the direct threat factors of each conservation object are first determined one by one in accordance with the specific methods of the Conservation Action Planning Manual. The threat factor rating is calculated based on the indicators of the severity, scope of impact, irreversibility, etc., with reference to the rating criteria for direct threat factors in the Protection Action Planning Manual[14].

It is divided into very high (level 4) and high (level 3), medium (level 2), low (level 1) 4 levels. Based on field surveys and years of experience in biodiversity conservation, 15 experts scored and summarized (**Table 3**, **Table 4**). Through the analysis of threat factors, a total of 10 threat factors were proposed, of which commercial collection, over-tourism development, overgrazing, and logging of construction timber were the most threatening.

Table 3. Protected objects key threat factors and levels of threat sorted table

Protect the object	Overall order of threat levels	Threat factor	Degree of compromise
Native forest vegetation	1	Overtourism development	4
		Overgrazing leads to degradation of grasslands	3
		Forest fires	2
		Mining activities	3
		Harvesting of building timber	2
		Illegal mining	2
		Farmers plant economic forests such as walnut forests	1
Alpine vertical ecosystems	3	Overtourism development	3
		Overgrazing	2
		Forest fires	1
		Commercial collection of medicinal plants	3
		Mining activities	1
		Economic forest planting	1
Cold temperate coniferous forests	5	The building consumes a lot of coniferous trees such as fir	4
		Commercial collection of fungi and medicinal plants	2
Sclerophyll evergreen broad-leaved forest	4	Firewood harvesting	4
		Harvesting of building timber	2
		Overgrazing	2
		Forest fires	1
		Commercial collection of non-timber forest products	1
Rare and endangered flora and fauna	2	Overtourism development	3
		Overgrazing	2
		Commercial collection of non-timber forest products	4
		Illegal poaching	3
		Biological invasions cause fragmentation or loss of habitat for species	2
		Farmers plant economic forests such as walnut forests	1
		Forest fires	1

Table 4. Comprehensive analysis of threat factors of protected objects

Threat factor	Native forest vegetation	Alpine vertical ecosystem	Cold temperate coniferous forest	Sclerophyll evergreen broadleaf forest	Rare and endangered flora and fauna	Worth	Threat sorting
Overtourism development	4	3	-	-	3	10	1
Overgrazing	3	2	-	2	2	9	2
Forest fires	2	1	-	1	1	5	4
Mining activities	3	1	-	-	-	4	5
Harvesting of building timber	2	-	4	2	-	8	3
Fuelwood collection		-	-	4	-	4	5
Illegal poaching and poaching	2	-	-	-	3	5	4
Economic forest planting	1	1	-	-	1	3	6
Biological invasion		-	-	-	2	2	7
Commercial collection		3	2	1	4	10	1

4. Functional zoning of biodiversity conservation on the western slope of Cangshan Mountain

According to the analysis of the protection objects and threat factors, with the goal of improving the living conditions of the protected objects and reducing the threat factors, the layout structure system of the overall plan is proposed, and the biodiversity of the Cangshan Mountain West Slope Protected Area is divided into the core area, buffer zone, experimental area and eco-tourism area of Cangshan Biodiversity Conservation, with species as the “point”, regional boundary as the “line”, ecosystem and scenic system as the “surface”, and the comprehensive protection planning system combining “point-line-surface” is realized.

According to the main habitat types and ecosystem properties required by the biological species on the western slope of Cangshan Mountain, it is

divided into three major functional areas (**Table 5**), and each functional area is divided into key protection areas and general control areas: Cangshan Mountain is set up as a core protection area above 3,000 m, and human circulation is prohibited in the area to protect species resources for the purpose of protecting the environment of germplasm resources. The core area is the most complete preservation of the native ecosystem, the protected objects and their native areas are concentrated, the rare and alpine dark coniferous forests are concentrated in the distribution area of natural vegetation, and the core of the protected glacier relics and species. The altitude of 2,600–3,000 m is the Cangshan Buffer Reserve, which is the outer periphery of the core area, in order to protect, prevent and mitigate the external influence and interference on the core area. The buffer zone can carry out a small or small capacity of tourism, popular science education, cultural activities, etc. The altitude of the eastern slope of Cangshan Nature Reserve is 2,200–2,600 m, and the altitude of the western slope is 2,000, 2,400–2,600 m for the experimental area. The main forests below 2,600 m in Cangshan Mountain are *Pinus armandii*, *Pinus yunnanensis*, *oak, Castanopsis fargesii, Rhododendron delavayi, Populus davidiana, Ericaceae, Camellia, Keteleeria evelyniana, Cinnamomum camphora, Schima superba*, handonggua, Shanyangmei, etc., and secondary oak bushes, ferns and other ornamental plants are mainly distributed in the area. In addition, in the buffer zone and experimental area, eco-tourism can be appropriately developed, which is mainly divided into Shimenguan Canyon Tour Area and West Slope Large Garden Natural Landscape Tour Area. The objects of protection are rare and endangered species resources and ecological natural landscapes.

On the basis of zoning protection, at the same time, the sustainable development of biodiversity planning, scientific research monitoring planning, infrastructure construction planning, ecotourism planning and publicity and education planning are implemented to curb threat factors and protect biodiversity systems.

Table 5. Biodiversity conservation zones on the western slope of Cangshan Mountain and the objects of conservation in each district

The partition type	Scope of protection	Area/hm^2	Conservation objects
Biodiversity conservation core zone	Altitude 3,000 m–pole	12,205.97	Remains of modern oceanic warm glaciers and ancient glaciers Complete alpine vertical with natural landscape Alpine meadow 3,700 ~ 4,100 m above sea level
Biodiversity conservation buffer zone	Altitude 2,600–3,000 m	7,232.45	Complete alpine vertical with natural landscape Colorful alpine vegetation types Cherish endangered animal resources
Biodiversity Conservation Experimental Zone	The eastern slope is 2,200–2,600 m above sea level, and the western slope is Altitude 2,000 m, 2,400–2,600 m 12,205. 97	1,171.58	Rare and endangered species Resources Existing vegetation and natural landscapes

5. Conclusion

The application of the Conservation Action Planning (CAP) method in the practice of biodiversity conservation on the western slope of Cangshan Mountain shows that the method provides a clear idea and logical analysis framework for the planning of biodiversity conservation in natural protected areas. Through meticulous preliminary investigation and analysis, the priority protection targets and primary threat factors are determined, which is the basis for guiding zoning planning and formulating protection strategies. The formulation of zoning scope and planning layout in the planning is the core content of the planning implementation. The results of this paper are yet to be done in step 4 of the CAP, which is a later effectiveness evaluation (including an assessment of the health status of species and ecosystems; assess the effectiveness of existing protection responses and protection actions; there is also an assessment of the extent to which the threat factor has decreased, the scale of investment in the protection project and the methods used) to examine and adjust the protection objectives, protection priorities and protection strategies through the feedback obtained, so as to determine new research directions.

Although CAP has been used to a certain extent in Nature Reserves in China, there are still some specific problems in practice, such as the preparation of conservation planning is mainly involved by relevant experts from scientific research institutions and universities, and the participation of protected area staff is not enough, which often leads to conservation planning often only staying in the preparation stage and unable to implement it in depth. Although the participation of the perennial staff of the protected area has been increased in this expert score, the participation of the staff of the reserve in the preparation of the conservation plan is still insufficient. Therefore, in the preparation stage of protection planning, more protected area staff should be involved in the formulation of the plan, so as to promote the real implementation of the protection plan.

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Conflict of interest

The authors declared no conflict of interest.

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