

云南省极小种群野生植物保护的 优先度分析*

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摘要: 我国于1997~2003年完成第1次全国重点保护野生植物资源调查后, 为加强珍稀濒危和重点保护野生植物的保护, 提出了“极小种群野生植物”的概念。随着极小种群野生植物概念和保护方法的完善, 保护行动取得了显著进展, 并陆续提出了各种不同的极小种群野生植物名录。本文在总结2005~2013年间云南省和国家林业局提出的所有极小种群野生植物名录基础上, 分析了各极小种群野生植物名录的起源和关系, 并对保护名录中的物种进行逐个比较。最后, 结合国家和省的保护需求, 将云南省77种极小种群野生植物分成5级, 按优先度实施保护行动: 第一批优先保护10个物种, 第二批优先保护13个物种, 第三批保护15个物种, 第四批保护10个物种, 第五批保护29个物种, 为云南省极小种群野生植物保护提供了指导和参考。

关键词: 极小种群野生植物; 生物多样性保护; 保护优先度; 云南省

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Conservation Priorities of Wild Plant Species with Extremely Small Populations (PSESP) in Yunnan Province

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Abstract: After the completion of the National Key Protected Wild Plant Resources Inventory from 1997 to 2003, in an effort to strengthen the conservation of rare and endangered plants in China, the concept of wild plant species with extremely small populations (PSESP) was proposed in 2005. With better understanding of the concept, improvement in methodologies, and progresses made in conservation actions, a number of PSESP lists from both national and provincial levels were subsequently promulgated in different stages to reorient conservation actions. There were, however, puzzles from various PSESP lists while conservation plans were being implemented. In this paper, we reviewed different PSESP lists in Yunnan Province from 2005 to 2013, and analyzed their origins and interrelationships. All PSESP lists were further indexed to make species-by-species comparison. Taking into account both the national and provincial conservation interests, we classified the 77 PSESP in Yunnan into five categories which were then prioritized for focusing conservation actions. The results showed that there were 10 species in the first batch, 13 species in the second batch, 15 in the third batch, 10 species in the fourth batch, and 29 species in the fifth batch. The study provides guidance for PSESP conservation in Yunnan, and can be used as references for other provinces.

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Key words: PSESP (Plant species with extremely small populations), biodiversity conservation, conservation priority, Yunnan Province

It is one of the five most important development strategies in Yunnan Province to preserve biodiversity treasures of China and build the shelter for ecological security in Southwest China. Based on the outcome of the first inventory of national key protected wild plant resources from 1997 to 2003^[1], Yunnan Province proposed the concept of Plant Species with Extremely Small Populations (PSESP) in 2005^[2]. The aim of PSESP was to conserve, in particular, those species on the brink of extinction. PSESP refers to geographically narrow-distributed plant species that have been disturbed and stressed by external factors over a long period of time and their populations are below minimum viable populations (MVP) for long-term survival in the wild^[3-5].

To strengthen the conservation of PSESP, a series of rescue and conservation plans have been formulated since A Proposal for Conserving the PSESP in Yunnan Province of China was submitted to the State Forestry Administration (SFA) in 2005. Conservation actions have made rapid progress since Yunnan Provincial Government approved the Planning Outline of Rescuing and Conserving Yunnan's PSESP (2010-2020) (Planning Outline) and the Emergency Action Plan for Rescuing and Conserving Yunnan's PSESP (2010-2015) (Emergency Action Plan) in 2010^[6]. In the Emergency Action Plan, 20 PSESP were specifically addressed to take imperative conservation actions^[7]. In October 2011, A Pilot Program for Conserving Yunnan's PSESP (Pilot Program) covering five species was jointly launched by SFA and Yunnan Provincial Government^[8]. In March 2012 the Implementation Plan of Rescuing and Conserving Yunnan's PSESP (2011-2015) (Implementation Plan) was issued by SFA and the National Development and Reform Commission (NDRC)^[3]. This marked that PSESP conservation was upgraded to nationwide actions in China. Following the Implementation Plan, concrete plans of conserving PSESP in different provinces and autonomous regions

were formulated.

1 PSESP in Provincial Conservation Plans

1.1 Species in the Planning Outline

Sixty-two plant species were identified as PSESP in the Planning Outline of Rescuing and Conserving Yunnan's PSESP (2010-2020)^[9], which was approved by Yunnan Provincial Government in March 2010 (Table 1).

Among these 62 species, 10 species had less than 10 individuals remaining in the wild. Nineteen species had 10 to 99 individuals, while another 19 species had 100 to 999 individuals. Only 14 species had over 1 000 individuals. Using the evaluation system of the International Union for Conservation of Nature (IUCN), 45 species were assessed as CR, seven species as EN, and one species as DD, while other nine species were not evaluated^[10].

1.2 Species in the Emergency Action Plan

Twenty PSESP were chosen to carry out urgent conservation actions in the Emergency Action Plan for Rescuing and Conserving Yunnan's PSESP (2010-2015), which was approved concurrent to the Planning Outline (Table 2).

Due to insufficient financial and human resources, 62 species in the Planning Outline were downsized to 20 species in the Emergency Action Plan based on further evaluation of the species' survival status. Before the implementation of the Emergency Action Plan, a Pilot Program covering five out of 20 species was launched in 2011 to explore methodologies and enhance the efficacy of conservation funds. These five species in the Pilot Program were *Nyssa yunnanensis*, *Manglietiastrum sinicum*, *Diploknema yunnanensis*, *Cyclobalanopsis sichourensis*, *Paraisometrum mileense*^[11].

Tab. 1 PSESP in the Provincial Planning Outline

Number of individual*	Number of species*	Species
< 10	10	<i>Angiopteris sparsisora</i> , <i>Christensenia assamica</i> , <i>Glyptostrobus pensilis</i> , <i>Manglietiastrum sinicum</i> , <i>Diploknema yunnanensis</i> , <i>Cyclobalanopsis sichouensis</i> , <i>Poncitrus polyandra</i> , <i>Nyssa yunnanensis</i> , <i>Acer yangbiense</i> , <i>Ferrocalamus strictus</i>
10-99	19	<i>Sorolepidium glaciale</i> , <i>Pinus squamata</i> , <i>Pinus wangii</i> , <i>Keteleeria xerophila</i> , <i>Manglietia ventii</i> , <i>Manglietia megaphylla</i> , <i>Magnolia sinensis</i> , <i>Michelia magnifica</i> , <i>Tsongiodendron odorum</i> , <i>Cercidiphyllum japonicum</i> , <i>Craigia yunnanensis</i> , <i>Pterospermum kingtungense</i> , <i>Pterocarpus indicus</i> , <i>Phellodendron chinense</i> , <i>Annamocarya sinensis</i> , <i>Mastixia euonymoides</i> , <i>Mastixia microcarpa</i> , <i>Diostros caiyangheensis</i> , <i>Cypripedium yunnanense</i>
100-999	19	<i>Archangiopteris bipinnata</i> , <i>Cycas hongheensis</i> , <i>Cycas longipetiolula</i> , <i>Cycas diannanensis</i> , <i>Cycas multifrondis</i> , <i>Cycas segmentifida</i> , <i>Magnolia odoratissima</i> , <i>Manglietia lucida</i> , <i>Magnolia phanerophlebia</i> , <i>Illicium difengp</i> , <i>Liriodendron chinensis</i> , <i>Camellia fascicularis</i> , <i>Rhododendron protistum</i> , <i>Hopea mollissima</i> , <i>Garcinia paucinervis</i> , <i>Bretschneidera sinensis</i> , <i>Picrorhiza scrophulariiflora</i> , <i>Hemiboeopsis longisepala</i> , <i>Paraisometrum mileense</i>
> 1 000	14	<i>Cycas tangingii</i> , <i>Cycas dolichophylla</i> , <i>Cycas multipinnata</i> , <i>Amentotaxus yunnanensis</i> , <i>Horsfieldia tetratapa</i> , <i>Myristica yunnanensis</i> , <i>Coptis quinquesecta</i> , <i>Eleutharhena macrocarpa</i> , <i>Malania oleifora</i> , <i>Aquilaria sinensis</i> , <i>Vatica xishuangbannaensis</i> , <i>Calycopterus floribunda</i> , <i>Dipteronia dyeriana</i> , <i>Madhuca pasquieri</i>

* Number of individual and Number of species were counted based on data available during 1997-2009.

Tab. 2 PSESP in the Provincial Emergency Action Plan*

No	Species	IUCN evaluation	Numbers [△]	Populations [*]	Occurred within the protected area
1	<i>Acer yangbiense</i>	CR	0-9	1	No
2	<i>Annamocarya sinensis</i>	CR	10-99	5-9	Yes
3	<i>Aquilaria sinensis</i>	CR	> 1 000	2	Yes
4	<i>Camellia fascicularis</i>	CR	-	3-4	No
5	<i>Coptis quinquesecta</i>	CR	> 1 000	1	Yes
6	<i>Cycas diannanensis</i>	CR	100-999	3-4	Yes
7	<i>Cycas hongheensis</i>	CR	100-999	1	No
8	<i>Cyclobalanopsis sichouensis</i>	CR	0-9	1	No
9	<i>Diploknema yunnanensis</i>	EN	0-9	1	Yes
10	<i>Keteleeria xerophila</i>	CR	-	1	No
11	<i>Malania oleifora</i>	CR	> 1 000	2	No
12	<i>Manglietia ventii</i>	CR	10-99	3-4	Yes
13	<i>Manglietiastrum sinicum</i>	CR	0-9	3-4	Yes
14	<i>Mastixia euonymoides</i>	EN	0-9	2	Yes
15	<i>Myristica yunnanensis</i>	EN	> 1 000	3-4	Yes
16	<i>Nyssa yunnanensis</i>	CR	0-9	2	No
17	<i>Paraisometrum mileense</i>	CR	100-999	1	No
18	<i>Pinus squamata</i>	CR	10-99	1	Yes
19	<i>Pinus wangii</i>	CR	10-99	3-4	Yes
20	<i>Poncitrus polyandra</i>	CR	0-9	1	No

* After Ma Yongpeng et al. 2013, [△], ^{*} Numbers and Populations were obtained from 2003 to 2012.

2 Yunnan's PSESP in the National Implementation Plan

The Implementation Plan of Rescuing and Conser-

ving Yunnan's PSESP (2011-2015), issued by SFA and NDRC in 2012 covered 120 PSESP in total. Among the 120 national PSESP, 38 species occur in Yunnan Province and 25 are endemic to Yunnan (Table 3).

Tab. 3 Yunnan's PSESP in the National Implementation Plan

No	Species	Protection grade	IUCN evaluation	Distribution site [△]	Number of individual [☆]
1	<i>Cycas hongheensis</i> *	I	CR	2	100
2	<i>Cycas dolichophylla</i>	I	NT	4	4 200
3	<i>Cycas debaoensis</i>	I	CR	1	1 200
4	<i>Cycas bifida</i>	I	VU	2	500
5	<i>Cycas diannanensis</i> *	I	VU	4	2 000
6	<i>Cycas multipinnata</i> *	I	EN	5	1 200
7	<i>Glyptostrobus pensilis</i>	I	CR	1	1
8	<i>Pinus wangii</i> *	II	EN	3	87
9	<i>Pinus squamata</i> *	I	CR	1	32
10	<i>Annamocarya sinensis</i>		EN	4	68
11	<i>Kmerria septentrionalis</i>	I		3	50
12	<i>Manglietiastrum sinicum</i> *	I	CR	3	18
13	<i>Tsoongiodendron odorum</i>		NT	3	50
14	<i>Horsfieldia tetratopala</i> *	II		5	4 101
15	<i>Myristica yunnanensis</i> *	II	CR	3	1 074
16	<i>Coptis quinquesecta</i> *			1	1 800
17	<i>Vatica guangxiensis</i>	II	CR	2	10
18	<i>Pterocarpus indicus</i>	II	VU	3	36
19	<i>Dipteronia dyerana</i> *	II		4	1 807
20	<i>Craigia yunnanensis</i> *	II	EN	13	65
21	<i>Pterospermum kingtungense</i> *	II	CR	2	25
22	<i>Calcyopteris floribunda</i>	I		2	1 403
23	<i>Camptotheca acuminata</i> *	II		8	71
24	<i>Nyssa yunnanensis</i> *	I		2	8
25	<i>Rhododendron protistum</i> var. <i>giganteum</i> *			3	3 750
26	<i>Madhuca pasquieri</i>	II	VU	5	2 000
27	<i>Paraisometrum mileense</i> *			1	740
28	<i>Cymbidium wenshanense</i> *			1	20
29	<i>Cypripedium forrestii</i>		EN	1	120
30	<i>Cypripedium lichiangense</i> *		EN	2	120
31	<i>Cypripedium margaritaceum</i>		EN	2	120
32	<i>Cypripedium singchii</i> *		EN	1	150
33	<i>Holcoglossum rupestre</i> *			1	200
34	<i>Paphiopedilum armeniacum</i> *		EN	4	500
35	<i>Paphiopedilum gratixianum</i> *			1	50
36	<i>Paphiopedilum spicerianum</i> *			1	10
37	<i>Paphiopedilum tranlienianum</i> *			1	100
38	<i>Paphiopedilum wenshanense</i> *			1	150

* Species endemic to Yunnan, △, ☆ Distribution site and Number of individual were obtained during 2003 to 2012

Among these 38 PSESP from the national Implementation Plan, two species (*Glyptostrobus pensilis* and *Nyssa yunnanensis*) had less than 10 individuals in all distribution sites in the wild, and both are under Grade I national key protection. There were 14 species with individuals from 10 to 99, including three Grade I national key protected plants (*Pinus squamata*, *Kmerria septentrionalis*, and *Manglietiastrum sinicum*) and six Grade II national key protected species. A total of 11 species had individuals ranging from 100 to 999, of which two species were under the Grade I national protection (*Cycas hongheensis* and *C. bifida*). Of the remaining 11 species with individuals from 1 000 to 9 999, five species (*Cycas dolichophylla*, *C. debaoensis*, *C. diannanensis*, *C. multipinnata*, and *Calycopteris floribunda*) were under the Grade I national key protection, while four species (*Horsfieldia tetratopala*, *Myristica yunnanensis*, *Dipteronia dyerana*, and *Madhuca pasquieri*) were under the Grade II national key protection^[12].

3 Conservation Priorities

3.1 Amount of PSESP in Yunnan Province

A total of four plans and one pilot program with different PSESP lists were formulated in Yunnan Province. At the national level, 38 species out of the 120 PSESP in the Implementation Plan, occur in Yunnan. At the provincial level, 62 PSESP were identified in the Planning Outline, 20 species in the Emergency Action Plan, and five species in the Pilot Program. A species-by-species comparison is made through realigning all plans. The comparison indicated that all PSESP in Yunnan Province totaled 77 species, after excluding those overlapped in the plans and programs.

3.2 Comparison among PSESP Lists

Comparison between the national Implementation Plan and the provincial Planning Outline indicated that 23 species were overlapped. The intersections of two sets of species were *Cycas hongheensis*, *C. dolichophylla*, *C. segmentifida*, *C. diannanensis*, *C. multipinnata*, *Glyptostrobus pensilis*, *Pinus wangii*, *P. squamata*, *Annamocarya sinensis*, *Manglietiastrum sinicum*, *Tsongiodendron odorum*, *Horsfieldia tetratopala*, *Myristica yunnanensis*,

Coptis quinquesecta, *Pterocarpus indicus*, *Dipteronia dyeriana*, *Craigia yunnanensis*, *Pterospermum kingtungense*, *Calycopteris floribunda*, *Nyssa yunnanensis*, *Rhododendron protistum* var. *giganteum*, *Madhuca pasquieri*, and *Paraisometrum mileense*.

Comparison between the national Implementation Plan and the provincial Emergency Action Plan indicated that 10 species overlapped. The intersections of two sets of species were *Cycas hongheensis*, *C. diannanensis*, *Pinus wangii*, *P. squamata*, *Annamocarya sinensis*, *Manglietiastrum sinicum*, *Myristica yunnanensis*, *Coptis quinquesecta*, *Nyssa yunnanensis*, and *Paraisometrum mileense*. These 10 species also overlapped with those in the provincial Planning Outline as those species listed in the provincial Emergency Action Plan comprised a subset of species in the provincial Planning Outline.

3.3 Prioritized Species

All 77 PSESP were classified into five categories with different priorities after reviewing and analyzing PSESP lists in Yunnan Province from 2005 to 2013, and fundamental principles adopted were: 1) Overlapped species were put into high priority, and the species overlapped in more PSESP lists were given higher priorities; 2) The species in the national Implementation Plan were assigned higher priority than those in the provincial plans; 3) At the provincial level, species listed in the Emergency Action Plan were given higher priority than those in the Planning Outline; 4) Biological characteristics and survival status were not discussed in the priority ranking as they were part of the multidisciplinary process to synthesize the PSESP list.

The first batch of PSESP that needs the most urgent conservation in Yunnan contains 10 species (Table 4), which overlapped in all of the three plans, i. e., the Implementation Plan, the Planning Outline, and the Emergency Action Plan. These species also equal to the intersections (10 species) between the Emergency Action Plan and the Implementation Plan. In the first batch of PSESP, four species, i. e., *Nyssa yunnanensis*, *Pinus wangii*, *Cycas hongheensis*, and *Paraisometrum mileense* which are distributed outside the protected areas should be of the highest concerns since they are exposed to direct external threats.

The second batch of PSESP that necessitates im-

perative conservation efforts in Yunnan contains 13 species. They are the remaining intersected portion between the provincial Planning Outline and the national

Implementation Plan, but with the 10 species in the first batch (Table 4) excluded.

Tab. 4 Conservation Priorities of PSESP in Yunnan Province

Priority	No	Species	protection grade	IUCN evaluation	Number of distribution site	Number of individual	Distribution area	Occurred within protected area
1 st Batch	1	<i>Cycas hongheensis</i>	I	CR	2	100	Gejiu	No
	2	<i>Cycas diannanensis</i>	I	CR	4	2 000	Gejiu, Mengzi, Pingbian, Hekou	Yes
	3	<i>Pinus wangii</i>	II	CR	3	87	Xichou, Maguan, Malipo	Partly
	4	<i>Pinus squamata</i>	I	CR	1	32	Qiaojia	Yes
	5	<i>Annamocarya sinensis</i>		CR	4	68	Funing, Xichou, Malipo, Guangnan	Yes
	6	<i>Manglietiastrum sinicum</i>	I	CR	3	18	Xichou, Maguan, Jinping	Yes
	7	<i>Myristica yunnanensis</i>	II	EN	3	1 074	Mengla, Jinghong, Jinping	Yes
	8	<i>Coptis quinquesecta</i>		CR	1	1 800	Jinping	Yes
	9	<i>Nyssa yunnanensis</i>	I	CR	2	8	Jinghong (Puwen)	No
	10	<i>Paraisometrum mileense</i>		CR	1	740	Shilin	No
2 nd Batch	1	<i>Cycas dolichophylla</i>	I	NT	4	4 200	Hekou, Pingbian, Wenshan, Maguan	No
	2	<i>Cycas segmentifida</i>	I	EN	2	1 000	Guannan, Funing	Yes
	3	<i>Cycas multipinnata</i>	I	CR	5	1 200	Gejiu, Mengzi, Pingbian, Jinping, Hekou	Yes
	4	<i>Glyptostrobus pensilis</i>	I	CR	1	1	Funing	No
	5	<i>Tsongiodendron odorum</i>	II	NT	3	50	Xichou, Maguan, Funing	Yes
	6	<i>Horsfieldia tetratepala</i>	II	EN	5	4 101	Jinping, Hekou, Luchun, Mengla, Lancang	Yes
	7	<i>Pterocarpus indicus</i>	II	VU	3	36	Hekou, Jinghong, Menglun	No
	8	<i>Dipteronia dyeriana</i>	II	CR	4	1 807	Pingbian, Mengzi, Wenshan, Funing	Yes
	9	<i>Craigia yunnanensis</i>	II	EN	13	65	Xichou, Maguan, Malipo, Luxi, Longchuan, Mojiang, Pingbian, Hekou, Jinping, Luchun, Yingjiang, Ruili, Lushui	Partly
	10	<i>Pterospermum kingtungense</i>	II	CR	2	25	Jinghong, Yingjiang (Tongbiguan)	No
	11	<i>Calycopteris floribunda</i>	I	CR	2	1 403	Yingjiang, Simao	Yes
	12	<i>Rhododendron protistum</i> var. <i>giganteum</i>	II	CR	3	3 750	Tengchong, Lushui, Gongshan	Yes
	13	<i>Madhuca pasquieri</i>	II	VU	5	2 000	Hekou, Pingbian, Jinping, Luchun, Malipo	Yes

Tab. 4 Conservation Priorities of PSESP in Yunnan Province(Continued...)

Priority	No	Species	protection grade	IUCN evaluation	Number of distribution site	Number of individual	Distribution area	Occurred within protected area
3 rd Batch	1	<i>Cycas debaoensis</i>	I	CR	1	1 200	Funing	No
	2	<i>Kmerria septentrionalis</i>	I		3	50	Hekou, Maguan, Malipo	Partly
	3	<i>Vatica quangxiensis</i>	II	CR	2	10	Wenshan, Xishuangbanna	No
	4	<i>Camptotheca acuminata</i>	II		8	71	Jinghong, Simao, Xiping, E' shan, Shiping, Shuangbai, Dayao, Pingbian	Partly
	5	<i>Cymbidium wenshanense</i>			1	20	Maguan	Yes
	6	<i>Cypripedium forrestii</i>		EN	1	120	Lijiang	Yes
	7	<i>Cypripedium lichiangense</i>		EN	2	120	Lijiang, Dali	Yes
	8	<i>Cypripedium margaritaceum</i>		EN	2	120	Lijiang, Shangri-La	Yes
	9	<i>Cypripedium singchii</i>		EN	1	150	Xichou	No
	10	<i>Holcoglossum rupestre</i>			1	200	Shangri-La	No
	11	<i>Paphiopedilum armeniacum</i>		EN	4	500	Fugong, Baoshan	Partly
	12	<i>Paphiopedilum gratixianum</i>			1	50	Wenshan	Partly
	13	<i>Paphiopedilum spicerianum</i>			1	10	Simao(Cuiyun)	No
	14	<i>Paphiopedilum tranlienianum</i>			1	100	Wenshan	Partly
	15	<i>Paphiopedilum wenshanense</i>			1	150	Wenshan	Partly
4 th Batch	1	<i>Keteleeria xerophila</i>	I	CR	1	-	Xiping-Yuanjiang	No
	2	<i>Manglietia ventii</i>	II	CR	3	< 50	Pingbian, Hekou, Jinping	Yes
	3	<i>Malania oleifora</i>	II	CR	2	3 310	Guangnan, Funing	No
	4	<i>Aquilaria sinensis</i>	II	CR	2	7 679	Jinghong, Mengla	Yes
	5	<i>Camellia fascicularis</i>	II	CR	3	-	Gejiu, Hekou, Maguan	No
	6	<i>Diploknema yunnanensis</i>	I	EN	1	1	Yingjiang	Yes
	7	<i>Cyclobalanopsis sichouensis</i>		CR	1	5	Funing	No
	8	<i>Poncirus polyandra</i>		CR	1	< 10	Funing	No
	9	<i>Acer yangbiense</i>		CR	1	4	Yangbi	No
	10	<i>Mastixia euonymoides</i>		EN	2	10-20	Menghai, Caiyanghe	Partly
5 th Batch	1	<i>Angiopteris sparsisora</i>	II	CR	1	3	Xichou	No
	2	<i>Archangiopteris bipinnata</i>	II	CR	2	-	Maguan, Malipo	No
	3	<i>Sorolepidium glaciale</i>	I	CR	3	-	Lijiang, Shangri-la, Deqin	Yes
	4	<i>Christensenia assamica</i>	II	CR	2	10	Jinping, Hekou	No
	5	<i>Cycas tangingii</i>	I	EN	1	-	Luchun	Yes
	6	<i>Cycas longipetiolula</i>	I	CR	3	124	Gejiu, Pingbian, Hekou	Yes
	7	<i>Cycas multifrondis</i>	I	CR	2	-	Gejiu, Mengzi	Yes
	8	<i>Amentotaxus yunnanensis</i>	I	CR	6	3 499	Gejiu, Pingbian, Hekou, Funing, Malipo, Xichou	Yes
	9	<i>Magnolia odoratissima</i>	II	CR	3	-	Guangnan, Qiubei, Xichou	Yes
	10	<i>Magnolia sinensis</i>	II	CR	1	-	Xuanwei	No
	11	<i>Magnolia phanerophlebia</i>		CR	1	200	Maguan	Yes
	12	<i>Manglietia lucida</i>		CR	1	< 200	Pingbian	Yes
	13	<i>Manglietia megaphylla</i>	II	CR	3	-	Maguan, Malipo, Xichou	Yes
	14	<i>Michelia magnifica</i>		CR	1	50-60	Luxi	Yes
	15	<i>Illicium difengpi</i>	II	CR	5	-	Hekou, Luchun, Funing, Malipo, Xichou	Yes

Tab. 4 Conservation Priorities of PSESP in Yunnan Province (Continued...)

Priority	No	Species	protection grade	IUCN evaluation	Number of distribution site	Number of individual	Distribution area	Occurred within protected area
5 th Batch	16	<i>Liriodendron chinensis</i>	II	CR	13	306	Chongming, Yiliang, Weixin, Dagan, Yongshan, Suijiang, Yanjin, Pingbian, Jinping, Yuanyang, Mengzi, Malipo, Dali	Yes
	17	<i>Cercidiphyllum japonicum</i>	II	CR	4	-	Qiaojia, Zhenxiong, Shuifu, Suijiang	No
	18	<i>Eleutharrhena macrocarpa</i>	I	CR	3	1 679	Simao, Jinghong, Lincang	Yes
	19	<i>Hopea mollissima</i>	I	CR	5	490	Pingbian, Luchun, Hekou, Maguan, Jinping	Yes
	20	<i>Vatica xishuangbannaensis</i>			2-3	-	Jinghong, Mengla, Menghai	No
	21	<i>Garcinia paucinervis</i>	II	CR	3	200	Malipo, Hekou, Maguan	No
	22	<i>Phellodendron chinense</i>	II	CR	2-3	-	Dali, Weixi	No
	23	<i>Bretschneidera sinensis</i>	I	CR	10	109	Yuanjiang, Mengzi, Pingbian, yanshan, Funing, Xichou, Simao, Jingdong, Menghai, Nanjian	Yes
	24	<i>Mastixia microcarpa</i>			1	3	Lijiang	Yes
	25	<i>Diosrtros caiyangheensis</i>				-	Simao	No
	26	<i>Picrorhiza scrophulariiflora</i>	II	DD	4	-	Shangri-la, Deqin, Gongshan, Weixi	Yes
	27	<i>Cypripedium yunnanense</i>		EN	3	-	Shangri-la, Yulong, Eryuan	Yes
	28	<i>Hemiboeopsis longisepala</i>		CR	1-2	300	Jinping, Hekou(?)	No
	29	<i>Ferocalamus strictus</i>			2	-	Jinping, Mojiang	No

Number of distribution site, number of individual, and distribution area were obtained during 2003-2012.

In the second batch, those species distributed outside the protected areas should be concerned with higher priorities for conservation actions. They are *Cycas dolichophylla*, *Glyptostrobus pensilis*, *Pterocarpus indicus*, *Pterospermum kingtungense*, and *Craigia yunnanensis*. Evidence from the most recent resources inventory, however, suggested that *Pterocarpus indicus* is an introduced rather than a native species in Yunnan, and should be removed from the list. Another challenge in conserving species in the second batch is that *Glyptostrobus pensilis* has only one individual on a single distribution site. The issues are whether it is worth the conservation efforts, and if it is a positive decision, then how it should be rescued.

The third batch of PSESP that needs to be conserved in Yunnan contains 15 species. They are the re-

maining portion of 38 national PSESP excluding the overlapped species (23 species) in the Planning Outline. All 15 species in the third batch are from the national Implementation Plan, but were not listed in provincial plans (Table 4). This batch consists of mainly plants in the Orchidaceae, which account for 73% of the total (11 out of 15). They are from four genera, i. e., *Cymbidium*, *Cypripedium*, *Holcoglossum*, and *Paphiopedilum*. Besides the 11 orchids, the other four species in the third batch are *Cycas debaoensis*, *Kmerria septentrionalis*, *Vatica guangxiensis* and *Camptotheca acuminata*.

The fourth batch of PSESP that needs to be conserved in Yunnan contains 10 species. They are the remaining species in the Emergency Action Plan with the 10 species overlapping in the Implementation Plan ex-

cluded, which have been given the highest conservation priority in the first batch. These 10 species in the fourth batch are the most important conservation targets, as far as the provincial government's interest is concerned (Table 4). It is the first time to conserve all species listed in the provincial plans, after all of the 38 species in the national Implementation Plan were assigned higher priorities in the first batch (10 species), second batch (13 species), and third batch (15 species).

The fifth batch of PSESP that needs to be conserved in Yunnan contains 29 species. They are the remaining ones in the Planning Outline, after excluding 23 species overlapped with the Implementation Plan and 20 species overlapped with the Emergency Action Plan. Ten species overlapped between these 23 and 20 species can not be deducted twice. So the number of left species in the Planning Outline is: $62 - 23 - 20 + 10 = 29$.

The fifth batch with the lowest conservation priority consists of species from the provincial Planning Outline (Table 4). These species in the fifth batch are insufficient in relevant data and information supports. There is a need to conduct supplementary resources inventories while conservation efforts on other batches with higher priorities are made, so as to consolidate the foundation for future conservation actions

4 Conclusion

It is clear that a total of 77 plant species in Yunnan's PSESP list need to be conserved in the coming 5-10 years. These 77 species are properly prioritized into five batches through comparing different plans at both provincial and national levels. Prioritization showed that, there are 10 species in the first batch, 13 species in the second batch, 15 in the third batch, 10 species in the fourth batch, and 29 species in the fifth batch. Based on the conservation priorities given, projects and funds can be properly assigned and allocated. At the same time, our effort endeavors to give a reference for other provinces to prioritize PSESP and conservation actions so as to appropriate the tight conservation budget to the highest conservation priorities.

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