Table S1. The classification and classification criteria of rare and endangered species selected in this study

Endangered category	Basis of division
Vulnerable (VU)	VU, taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	NT taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Endangered (EN)	EN, taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Critically Endangered (CR)	CR, taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Extinct (EX)	EX, taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed extinct when exhaustive surveys in known and/or expected habitats, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	EW, taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity, or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitats, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

The A-E here are the five classification conditions: A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations). B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy). C. Small population size and decline. D. Very small or restricted population. E. Quantitative Analysis[1].

Table S2. The list of species used in the article is classified by the family

Family	Records	Family	Records
Accipitridae	204	Laridae	25
Actinidiaceae	33	Lauraceae	83
Alcedinidae	27	Leiothrichidae	7

Anacardiaceae	6	Magnoliaceae	95
Anatidae	209	Malvaceae	23
Animalia （species group）	68	Megophryidae	23
Annonaceae	18	Melanthiaceae	117
Apocynaceae	26	Meliaceae	8
Aquifoliaceae	47	Moraceae	7
Araliaceae	36	Musaceae	7
Arecaceae	6	Myristicaceae	10
Aristolochiaceae	9	Orchidaceae	265
Asteraceae	27	Phasianidae	319
Atyidae	6	Picidae	27
Begoniaceae	13	Pinaceae	168
Berberidaceae	30	Piperaceae	9
Betulaceae	34	Plantae（species group）	77
Bovidae	11	Podocarpaceae	6
Bucerotidae	69	Polypodiaceae	15
Bufonidae	12	Pomatiopsidae	7
Caprifoliaceae	21	Proteaceae	14
Celastraceae	7	Psittacidae	107
Cephalotaxaceae	23	Pteridaceae	29
Cercopithecidae	56	Ranidae	50
Cervidae	7	Ranunculaceae	16
Charadriidae	91	Rhacophoridae	10
Chloropseidae	98	Rhizophoraceae	7
Columbidae	7	Rosaceae	18
Corvidae	10	Rubiaceae	20
Cupressaceae	126	Salamandridae	56
Cycadaceae	56	Sapindaceae	129
Dicroglossidae	58	Sciuridae	14
Dioscoreaceae	6	Scolopacidae	18
Dipterocarpaceae	17	Sittidae	124
Elephantidae	11	Styracaceae	7
Ericaceae	41	Taxaceae	61
Fabaceae	33	Theaceae	54
Fagaceae	64	Thymelaeaceae	14
Felidae	11	Timaliidae	10
Fungi（species group）	13	Tricholomataceae	6
Ginkgoaceae	12	Trogonidae	7
Gruidae	51	Ulmaceae	10

Hylobatidae	15	Ursidae	6
Indicatoridae	20	Velloziaceae	10
Juglandaceae	23	Vitaceae	8
Lamiaceae	11	Zingiberaceae	37

Table S3. Environmental variables used for modeling Yunnan province.

Variables	Indicators	Data source
Climatic factors	bio1 Annual mean temperature	WorldClim (http://worldclim.org/version2)
	bio2 Mean diurnal range	
	bio3 Isothermality	
	bio4 Temperature seasonality	
	bio7 Temperature annual range	
	bio8 Mean temperature of wettest quarter	
	bio9 Mean temperature of driest quarter	
	bio10 Mean temperature of warmest quarter	
	bio11 Mean temperature of coldest quarter	
	bio12 Annual precipitation	
	bio14 Precipitation of driest month	
	bio15 Precipitation seasonality	
	bio19 Precipitation of coldest quarter	
Topographical factor	DEM Digital elevation model	WorldClim (http://worldclim.org/version2)
	Slope	
	Aspect	
Vegetation factors	NDVI Normalized Difference Vegetation Index	United States Geological Survey (USGS) (https://www.usgs.gov)

Table S4. Correlation analysis of 19 biological environmental variables

	bio1	bio2	bio3	bio4	bio5	bio6	bio7	bio8	bio9	bio10	bio11	bio12	bio13	bio14	bio15	bio16	bio17	bio18	bio19
bio1	1	0.192	0.522	-0.672	0.968	0.98	-0.512	0.972	0.973	0.974	0.988	0.63	0.644	0.321	0.551	0.679	0.237	0.635	0.107
bio2	0.192	1	0.771	-0.53	0.174	0.053	0.231	0.069	0.305	0.071	0.274	-0.105	-0.097	-0.172	0.027	-0.093	-0.222	-0.135	-0.158
bio3	0.522	0.771	1	-0.932	0.386	0.478	-0.436	0.337	0.649	0.341	0.632	0.327	0.327	0.113	0.241	0.343	0.135	0.296	0.097
bio4	-0.672	-0.53	-0.932	1	-0.515	-0.672	0.67	-0.49	-0.787	-0.495	-0.771	-0.573	-0.567	-0.263	-0.35	-0.583	-0.294	-0.531	-0.227
bio5	0.968	0.174	0.386	-0.515	1	0.932	-0.321	0.984	0.921	0.985	0.933	0.539	0.556	0.255	0.525	0.588	0.131	0.536	0.03
bio6	0.98	0.053	0.478	-0.672	0.932	1	-0.639	0.952	0.955	0.954	0.973	0.675	0.687	0.355	0.55	0.719	0.298	0.675	0.16
bio7	-0.512	0.231	-0.436	0.67	-0.321	-0.639	1	-0.402	-0.545	-0.404	-0.565	-0.626	-0.621	-0.388	-0.326	-0.638	-0.505	-0.633	-0.361
bio8	0.972	0.069	0.337	-0.49	0.984	0.952	-0.402	1	0.91	1	0.932	0.564	0.582	0.3	0.534	0.617	0.194	0.583	0.064
bio9	0.973	0.305	0.649	-0.787	0.921	0.955	-0.545	0.91	1	0.913	0.991	0.667	0.672	0.335	0.503	0.699	0.271	0.643	0.183
bio10	0.974	0.071	0.341	-0.495	0.985	0.954	-0.404	1	0.913	1	0.935	0.568	0.585	0.301	0.531	0.62	0.198	0.582	0.07
bio11	0.988	0.274	0.632	-0.771	0.933	0.973	-0.565	0.932	0.991	0.935	1	0.648	0.658	0.323	0.533	0.69	0.26	0.641	0.142
bio12	0.63	-0.105	0.327	-0.573	0.539	0.675	-0.626	0.564	0.667	0.568	0.648	1	0.972	0.454	0.426	0.977	0.526	0.947	0.458
bio13	0.644	-0.097	0.327	-0.567	0.556	0.687	-0.621	0.582	0.672	0.585	0.658	0.972	1	0.319	0.58	0.992	0.378	0.974	0.293
bio14	0.321	-0.172	0.113	-0.263	0.255	0.355	-0.388	0.3	0.335	0.301	0.323	0.454	0.319	1	-0.211	0.351	0.815	0.361	0.724
bio15	0.551	0.027	0.241	-0.35	0.525	0.55	-0.326	0.534	0.503	0.531	0.533	0.426	0.58	-0.211	1	0.598	-0.383	0.601	-0.534
bio16	0.679	-0.093	0.343	-0.583	0.588	0.719	-0.638	0.617	0.699	0.62	0.69	0.977	0.992	0.351	0.598	1	0.389	0.981	0.289
bio17	0.237	-0.222	0.135	-0.294	0.131	0.298	-0.505	0.194	0.271	0.198	0.26	0.526	0.378	0.815	-0.383	0.389	1	0.375	0.915
bio18	0.635	-0.135	0.296	-0.531	0.536	0.675	-0.633	0.583	0.643	0.582	0.641	0.947	0.974	0.361	0.601	0.981	0.375	1	0.265
bio19	0.107	-0.158	0.097	-0.227	0.03	0.16	-0.361	0.064	0.183	0.07	0.142	0.458	0.293	0.724	-0.534	0.289	0.915	0.265	1

Table S5.AUC value in the current and various situational model running processes

Scenario	AUC(average)
Current	0.8627
RCP2.6,2050	0.8616
RCP2.6,2070	0.8616
RCP4.5,2050	0.8573
RCP4.5,2070	0.8616
RCP6.0,2050	0.8547
RCP6.0,2070	0.8596
RCP8.5,2050	0.8577
RCP8.5,2070	0.8592

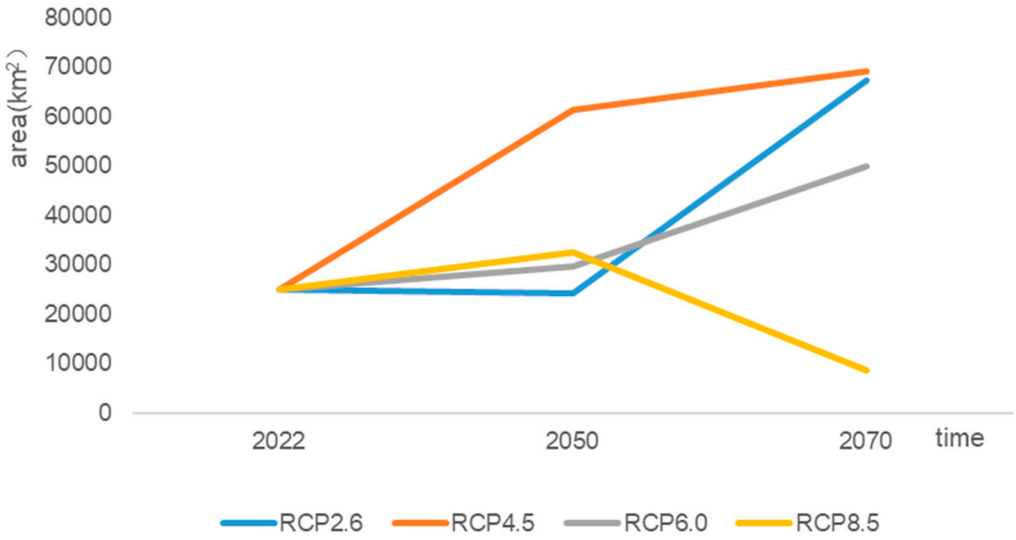


Figure S1. Changes in high-richness areas over time under different emission modes

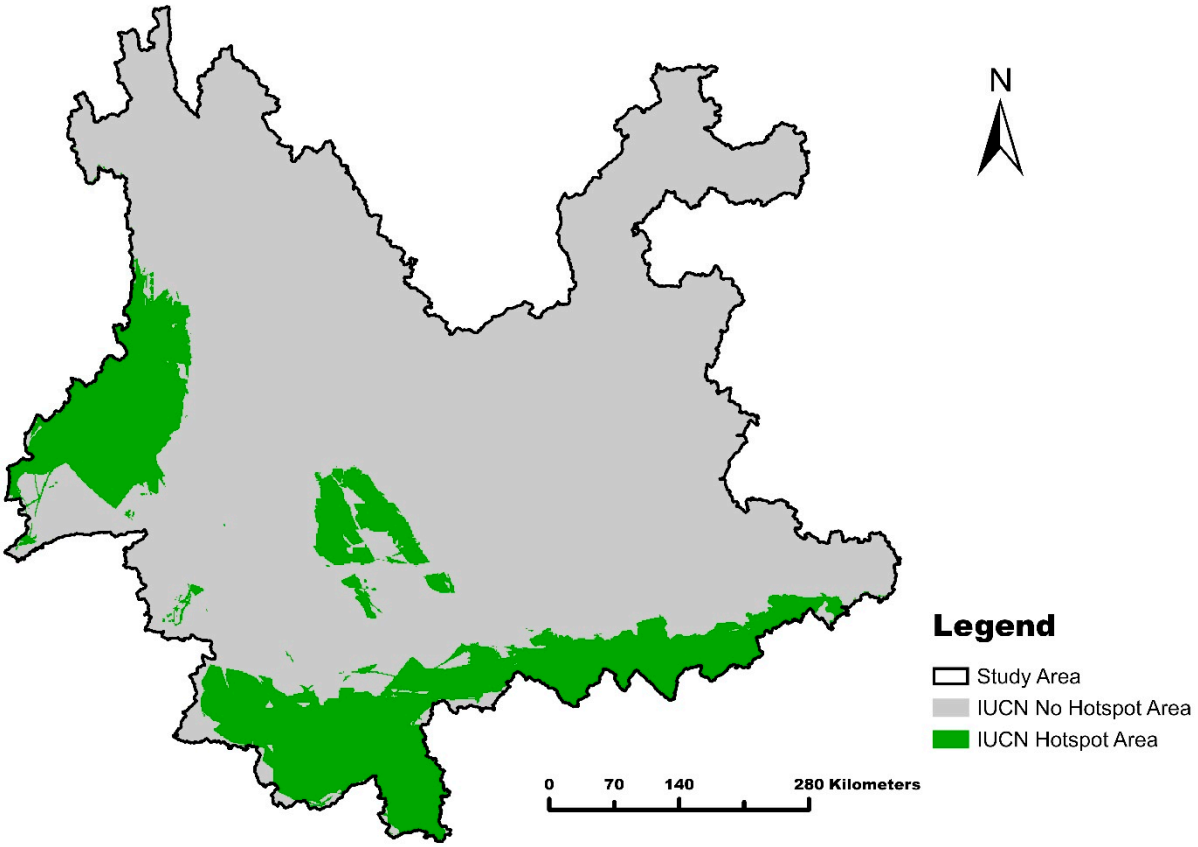


Figure S2. Hotspot distribution predicted by IUCN data

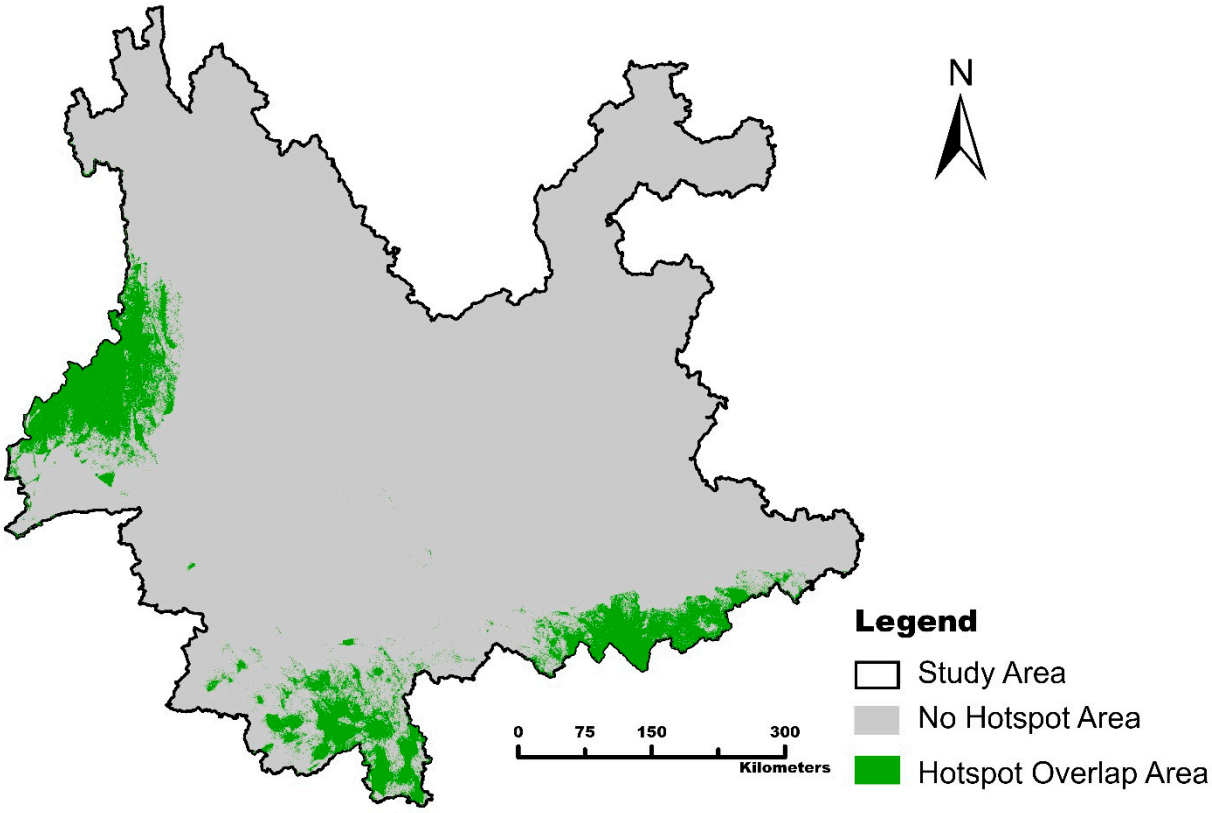
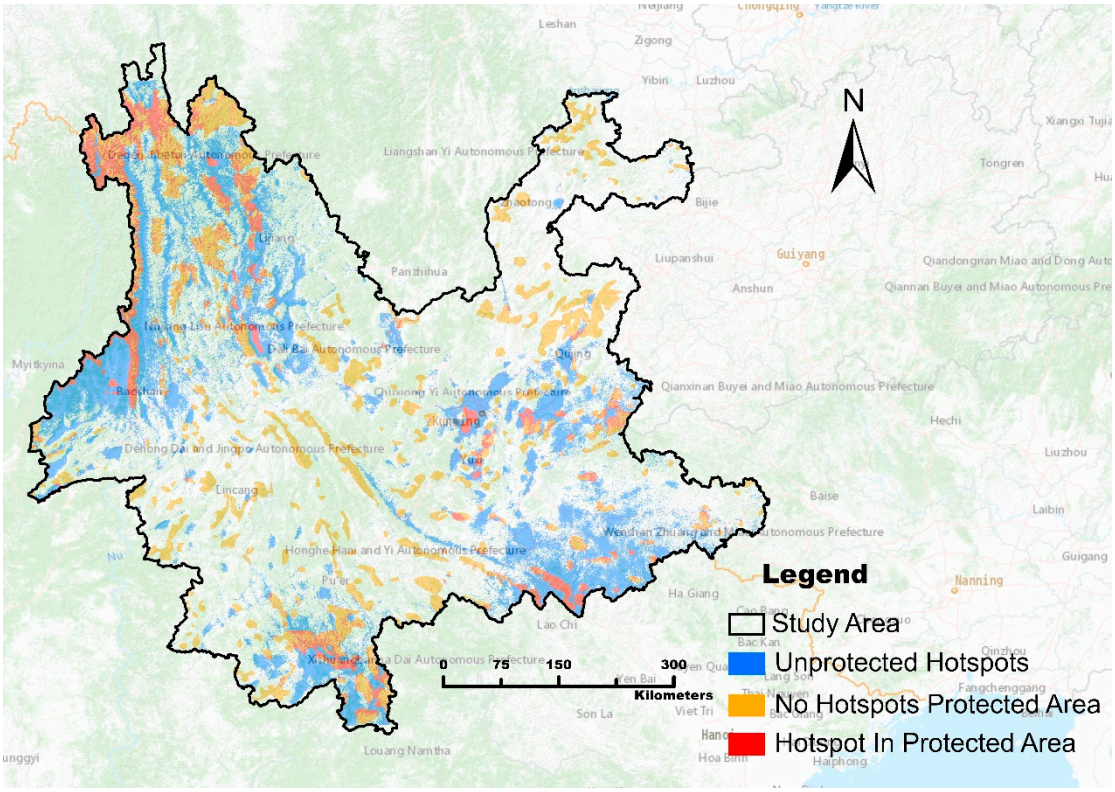


Figure S3. Overlap hotspot distribution predicted by MaxEnt model and IUCN data



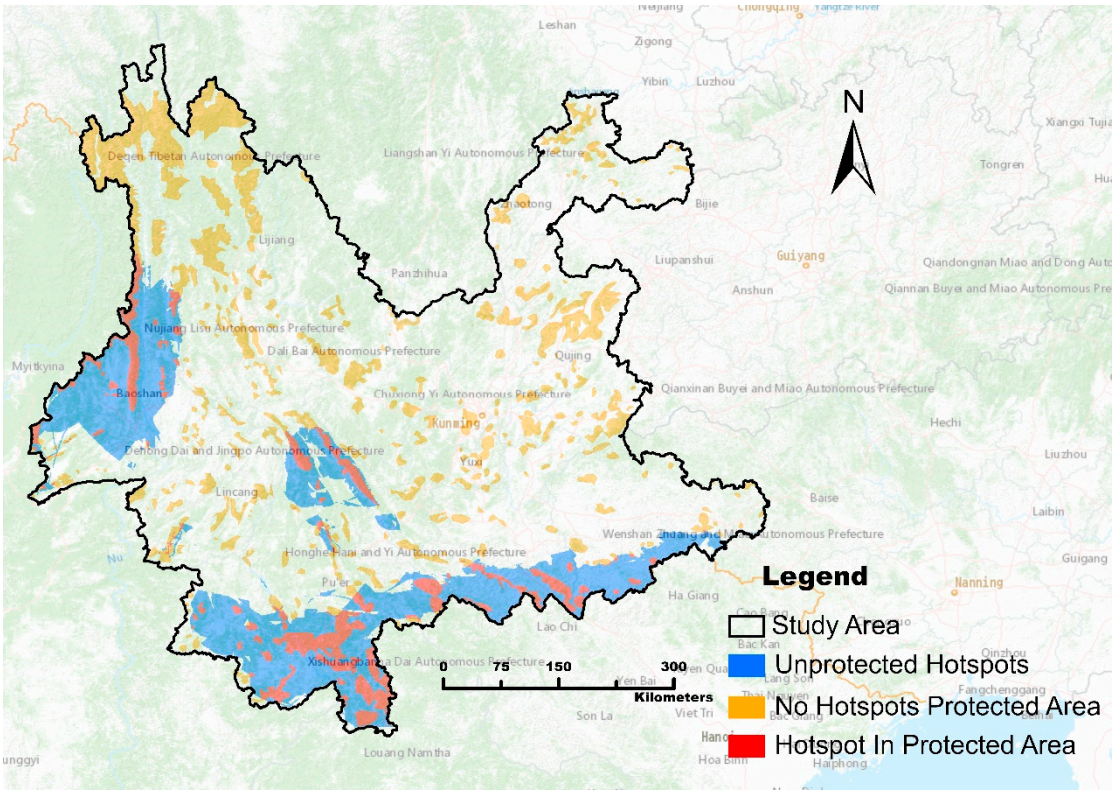


Figure S4. Distribution of protected hotspots in MaxEnt forecast and IUCN data forecast results

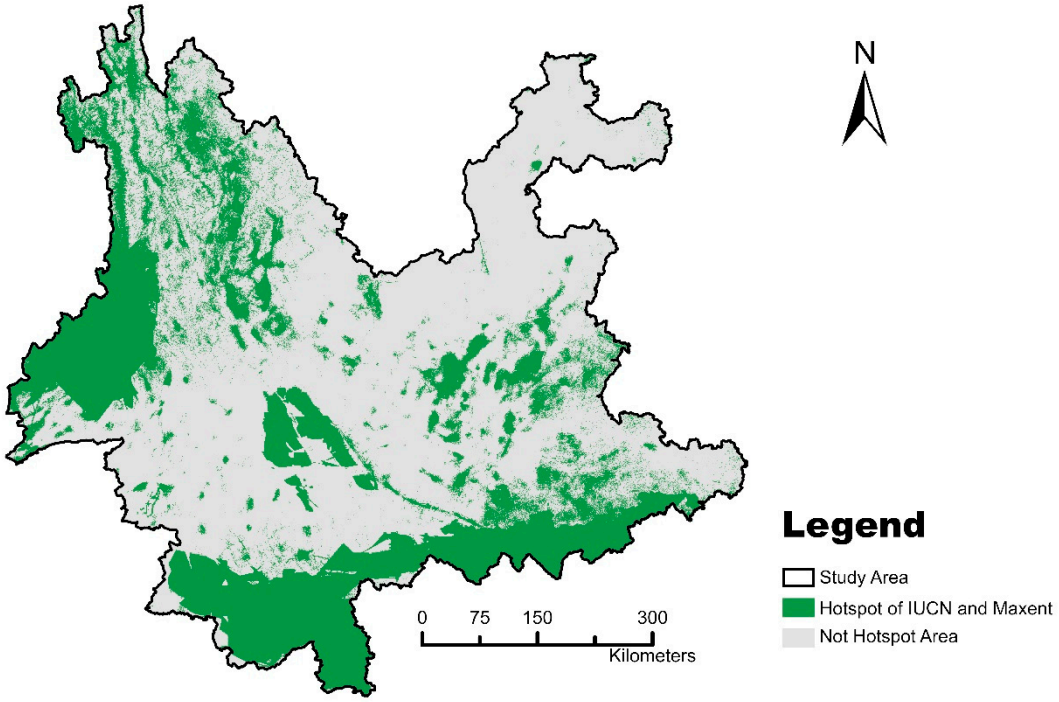


Figure S5. The IUCN hotspot area and MaxEnt hotspot area merged region

Table S6. Richness area transfer matrix under RCP4.5,RCP6.0 and RCP8.5 scenarios

RCP4.5 2050						
		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
2022	Unsuitable area	48349.77	77407.26	41897.47	3876.65	171531.15
	Low richness area	22953.71	37039.53	45626.68	15955.26	121575.17
	Medium richness area	6145.16	12391.52	24652.56	23077.37	66266.61
	High richness area	278.18	1294.85	4911.67	18596.10	25080.80
	Total (km²)	77726.81	128133.16	117088.38	61505.38	384453.74

RCP4.5 2070

		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
RCP4.5 2050	Unsuitable area	51707.08	25936.51	83.23	77726.82	155453.63
	Low richness area	9143.31	87334.42	29588.08	2067.36	128133.16
	Medium richness area	1131.37	22302.56	75405.08	18249.37	117088.38
	High richness area	61505.38	4.66	12680.69	48795.85	122986.58
	Total (km²)	123487.14	135578.14	117757.07	146839.40	523661.75

RCP6.0 2050

		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
2022	Unsuitable area	82457.38	74090.63	14129.13	854.01	171531.15
	Low richness area	32472.97	52345.81	32046.52	4709.87	121575.17
	Medium richness area	9439.05	20305.33	26438.70	10083.53	66266.61
	High richness area	678.43	3228.22	7047.42	14126.73	25080.80
	Total (km²)	125047.83	149969.99	79661.78	29774.14	384453.74

RCP6.0 2070

		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
RCP6.0 2050	Unsuitable area	43379.62	79676.18	1992.03	0.0018	125047.83
	Low richness area	1381.81	89271.52	57935.78	1380.88	149969.99

	Medium richness area	30.32	14285.24	41444.35	23901.87	79661.78
	High richness area	29774.14	435.82	4675.80	24658.01	59543.77
	Total (km²)	74565.89	183668.77	106047.96	49940.75	414223.37

RCP8.5 2050						
		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
2022	Unsuitable area	87768.15	70759.51	12438.84	564.65	171531.15
	Low richness area	31565.05	54183.31	30678.06	5148.75	121575.17
	Medium richness area	8546.46	21213.17	24062.87	12444.12	66266.61
	High richness area	714.74	3024.83	6907.35	14433.88	25080.80
	Total (km²)	128594.41	149180.81	74087.12	32591.40	384453.74

RCP8.5 2070						
		Unsuitable area	Low richness area	Med richness area	High richness area	Total (km²)
RCP8.5 2050	Unsuitable area	100434.19	28115.92	44.29	128594.41	257188.82
	Low richness area	28158.13	101035.29	19987.40	149180.81	298361.62
	Medium richness area	1423.37	34110.19	38340.14	213.41	74087.12
	High richness area	0.17	2959.80	21147.85	8483.59	32591.40

Total (km^2)	130015.87	166221.19	79519.68	286472.22	662228.96

The steps for making the richness transfer matrix are as follows:

1. Extract the layers of each richness area and assign them a value of 1.

2. Add each of the two richness layers at different times with the raster calculator tool. The value of 2 is the part that has shifted between the two richness layers over time.

3. Calculate the area of the calculated area with the value of 2 and fill it into the prepared richness transfer matrix.

We have included this part of the article and supplementary material.

Table S7. Data comparison of two prediction models

	Maximum entropy model predictions	IUCN data predictions
Overlap area with hot spot area	42118.31km^2	40377.51km^2
Proportion of overlapping areas in Yunnan Province	0.0122%	0.0117%
Proportion of overlapping area in protected area	64.2457%	61.5903%
Proportion of hot spots in overlapping areas	19.7810%	18.2746%

Table S8. The current proportion of land use types in hotspots

Type of land use	Area(km^2)	Proportion

Arable Land	23665.39	25.32%
Woodland	41262.03	44.14%
Grassland	22954.51	24.56%
Waters	2134.76	2.28%
Urban and rural, Industrial and Mining, Residential Land	2313.97	2.48%
Unused land	1140.47	1.22%

Table S9. Ranking of hot spot areas in prefecture-level cities

Emission scenarios	Ranking of areas of high richness		
	1	2	3
Current	Baoshan	Honghe	Dali
RCP2.6,2050	Honghe	Kunming	Baoshan
RCP2.6,2070	Baoshan	Dehong	Xishuangbanna
RCP4.5,2050	Honghe	Baoshan	Xishuangbanna
RCP4.5,2070	Baoshan	Dehong	Honghe
RCP6.0,2050	Baoshan	Dehong	Kunming
RCP6.0,2070	Baoshan	Kunming	Dali

RCP8.5,2050	Baoshan	Dehong	Nujiang
RCP8.5,2070	Baoshan	Dehong	Qvjing

Reference

[106] IUCN. IUCN Red List Categories and Criteria: Version 3.1. Second edition.Gland, Switzerland and Cambridge, UK: IUCN, 2012; pp.14-29.