Appendix S1

# Table 1S: The list of 46 key species in study area

|  |  |  |
| --- | --- | --- |
| List | Species | Endemic |
| 1 | *Dysosma versipellis* | China endemic |
| 2 | *Paphiopedilum emersonii (Emerson's Paphiopedilum)* |  |
| 3 | *Semiliquidambar cathayensis* | China endemic |
| 4 | *Cephalotaxus oliveri (Oliver's Plum Yew)* | China endemic |
| 5 | *Calocedrus macrole (Chinese Incense-cedar)* |  |
| 6 | *Kmeria septentrionalis* | China endemic |
| 7 | *Metabriggsia ovalifolia* | China endemic |
| 8 | *Eucommia ulmoides* |  |
| 9 | *Pseudotsuga brevifolia* |  |
| 10 | *Thamnocharis esquirolii*  | China endemic |
| 11 | *Fokienia hodginsii (Fujian Cypress)* |  |
| 12 | *Toona ciliata (Red Cedar)* |  |
| 13 | *Taxus wallichiana var. chinensis* |  |
| 14 | *0rmosia henryi* |  |
| 15 | *Pinus kwangtungensis* | China endemic |
| 16 | *Pseudotsuga sinensis (Chinese Douglas-fir)* | China endemic |
| 17 | *Cibotium baronetz* |  |
| 18 | *Phoebe bournei* | China endemic |
| 19 | *Taxus wallichiana var. mairei* | China endemic |
| 20 | *Phoebe zhennan* | China endemic |
| 21 | *Zenia insignis* |  |
| 22 | *Machilus pingii* | China endemic |
| 23 | *Eurycorymbus cavaleriei* | China endemic |
| 24 | *Euchresta japonica* |  |
| 25 | *Manglietia calcarea*  | KASC endemic |
| 26 | *Ceratopteris thalictroides (Mul-go-sa-ri)* | China endemic |
| 27 | *Tetrathyrium subcordatum* | China endemic |
| 28 | *Alsophila spinulosa* |  |
| 29 | *Camptotheca acuminata* | China endemic |
| 30 | *Michelia angustioblonga* | KASC endemic |
| 31 | *Emmenopterys henryi* | China endemic |
| 32 | *Manglietia aromatica* | KASC endemic |
| 33 | *Cinnamomum camphora* |  |
| 34 | *Paphiopedilum barbigerum (Beard Carrying Paphiopedilum)* | China endemic |
| 35 | *Mussaenda anomala* | China endemic |
| 36 | *Paphiopedilum micranthum (Tiny Flowered Paphiopedilum)* |  |
| 37 | *Handeliodendron bodinieri* | China endemic |
| 38 | *Sinopteris grevilleoides* | China endemic |
| 39 | *Tyto capensis (Short-eared Owl)* |  |
| 40 | *Hoplobatrachus rugulosus* |  |
| 41 | *Catopuma temminck (Asiatic Golden Cat)* |  |
| 42 | *Pitta moluccensis (Blue-winged Pitta)* |  |
| 43 | *Glaucidium brodiei (Collared Owlet)* |  |
| 44 | *Macaca mulatta (Rhesus Monkey)* |  |
| 45 | *Tylototriton asperrimus (Black Knobby Newt)* |  |
| 46 | *Mergus squamatus (Scaly-sided Merganser)* | China endemic |

# Table 2S. The list of ZONATION 4GUI input files with data sources and methods.

|  |  |  |  |
| --- | --- | --- | --- |
| ZONATION 4GUI input files | Data | Sources  | Methods |
| A set of biodiversity feature grids | Records of plant species  | Information System of Chinese Rare and Endangered Plants (http://www.iplant.cn/rep/) at the Institute of Botany, the Chinese Academy of Sciences & Field work | Species Distribution Models (SDM) |
| Records of animal species | China Animal Scientific Database (http://www.zoology.csdb.cn/) & Field work |
| Elevation | [Shuttle Radar Topography Mission,SRTM source from Resource and Environment Data Cloud Platform of the Chinese Academy of Sciences (http://www.resdc.cn)](http://srtm.csi.cgiar.org/) |
| Soil type | Resource and Environment Data Cloud Platform of the Chinese Academy of Sciences (http://www.resdc.cn) |
| Vegetation type | Digitalized "1:1,000,000 China Vegetation Atlas" |
| Land use  | Qiannan Prefecture Land and Resources Department |
| Associated biodiversity feature list file | The List of “National key protected wildlife species”;The List of “Provincial key protected wildlife species” | China National Park Administration (http://www.forestry.gov.cn/);Qiannan Prefecture Forestry Bureau |  |
| Weights file | IUCN red list status | Information System of Chinese Rare and Endangered Plants (http://www.iplant.cn/rep/) at the Institute of Botany, the Chinese Academy of Sciences  | See details in section Conservation weights |
| Endemicity of a species |
| Economic value of a species |
| Removal mask layer | Existing protect areas | Longitude and latitude information of field surveys conducted by the Qiannan Prefecture Forestry Bureau | ArcGIS x and y coordinates |
| Cost layer | Transportation infrastructure, rural residents | Digital map of China in 2017 (http://gisserver.tianditu.gov.cn/TDTService/wfs) | Human disturbance index (HDI) and see details in section cost layer |
| Urban land use, farmland | Qiannan Prefecture Land and Resources Department "Landuse in 2017" |
| Mines, hydroelectric stations | Report of "Comprehensive Planning of the Zhangjiang River Basin" |
| Condition layer | The vegetation Net Primary Productivity  | Moderate Resolution Imaging Spectroradiometer from 2000 to 2016 | Carnegie-Ames-Stanford approach (CASA) model |
| Planning units | Elevation | [Shuttle Radar Topography Mission,SRTM source from Resource and Environment Data Cloud Platform of the Chinese Academy of Sciences (http://www.resdc.cn)](http://srtm.csi.cgiar.org/) | ArcGIS Hydrology tool |

# *Spatial Conservation Prioritization*

We developed two Zonation variants each introducing the analyses feature. By developing the full analysis in such sequential way, it is possible to examine the effects each scenario analysis feature has on the results. The sequence of variants was the following:

**Scenario 1: All features + weights + condition + hierarchical mask:** Net Primary Production is used as a proxy for the ecological condition (see main text).

**Scenario 2: All features + weights + condition + cost + hierarchical mask:** Human influence index is used as a proxy for the socio-economic cost (see main text).

## Conservation weights

## Per-species weight components

While the weighting scheme is subjective, some differences in feature weights are often warranted. Below, we list the rationale and values of individual weighting components. For the description of the final compound weights, see the main text.

### *Red List category*

Individual species were weighted by the IUCN red List with the values used by Lehtomaki et al. (2018)

LC (least concern) = 1

NT (near threatened) = 2

VU (vulnerable) = 4

EN (endangered) = 6

CR (critically endangered) = 8

DD (data deficient) = 2

### *Endemicity*

Endemic species were determined from Information System of Chinese Rare and Endangered Plants (http://www.iplant.cn/rep/) at the Institute of Botany, the Chinese Academy of Sciences and China Animal Scientific Database. We gave value of 1 for non-endemic, value of 4 for endemic species and value of 8 for KASC endemic species according to expert knowledge.

### *Economic Values*

Economic value might include being used for medicines, pigments, and as a source of potherbs, oils, fiber, nectar or spices. The information of species economic values was from the same sources with above “Endemicity” section. Experts determined species with five kinds of the value or more = 8, four kinds of the value = 6, three kinds of the value =4, one or two kinds of the value=2, no economic value =1.

## Per-taxon weight components

### *Ecosystem functioning*

We gave the highest weight to plants in terms of ecosystem functioning (see Table S2). In KASC mostly covered by forests, plant is the foundation taxon and may be the most influential for the ecosystem functioning. Mammals, especially for large species, can also have larger impact on ecosystem properties compared with the other vertebrate taxa. Amphibians may smaller than the other vertebrates, because of their relatively small body mass.

### *Ecosystem services provided*We also gave the highest weight to plants in terms of ecosystem services (see Table S2). In the forest ecosystems, plants largely contribute to provide and support many kinds of ecosystem services (e.g. provisioning woods, fuels, and foods, and regulation of environment). Birds and mammals can be a food resource and/or target of hunting activity. Compared with those, contribution of amphibians to ecosystem services may be miscellaneous as far as we know.

### *Overall number of species in the group*

### Plants have extraordinary larger number of species than vertebrate taxa. Birds have relatively higher number of species than the other vertebrates.

References please check the main text.

## Fig. S1 Distribution map of the five aspects in terms of socio-economic cost