



## Saving Nature's Diversity: Effective Conservation Strategies for Endangered Flora

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The conservation of endangered flora is a critical aspect of biodiversity preservation, as plant species play fundamental roles in maintaining ecosystem functions and providing essential resources for both wildlife and humans. However, many plant species are currently facing extinction due to habitat loss, climate change, overexploitation, invasive species, and pollution. To mitigate this, various conservation strategies have been developed, including in situ and ex situ approaches. In situ conservation, such as the establishment of protected areas and nature reserves, aims to maintain species within their natural habitats, fostering natural growth and adaptation to environmental changes. Successful conservation efforts require a multifaceted approach that integrates scientific research, public awareness, and policy implementation to ensure long-term sustainability. In order to establish adaptive solutions that can meet the issues of environmental degradation and climate change, cooperation between governmental institutions, non-governmental organisations, and local populations is essential. By supporting these all-encompassing strategies, we can contribute to protecting threatened plants for coming generations and guaranteeing the resilience of ecosystems everywhere.

**Keywords:** Conservation, Endangered, Flora

### Introduction

After the Convention on Biological Diversity (CBD) went into effect, there was a period of intense conservation efforts and an even greater influx of books, papers, reports, action plans, targets, and strategies. However, the recent trajectory of biodiversity conservation has gone from one of expectation and optimism to one of grudging acceptance that none of this is enough. The newest study of the progress towards the objectives notes that many of the CBD's Aichi objectives for biodiversity will not be fulfilled given present trends, and that biodiversity loss at all levels is continuing at an alarming rate, faster than it can recover (CBD, 2016). Johnson et al. (2017). Come to such conclusion in their study of biodiversity losses and conservation responses in the Anthropocene. While there have been some positive outcomes from conservation initiatives, they have largely prevented some losses by addressing the signs of excessive environmental usage. Our accomplishments have been crucial in buying time that may eventually allow species and ecosystems to recover and in teaching us how to make conservation efforts more successful. But the issue of changing the underlying causes of unsustainable nature usage is still mostly unsolved. The first regional assessments of biodiversity and ecosystem services created by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) support this view

by showing that biodiversity is declining globally, greatly diminishing nature's ability to adapt to new situations and be resilient, as well as its contribution to human well-being.

### Endemism and causes of endangerment

The biological condition of a species being exclusive to a certain geographic area or kind of habitat is known as endemism. Because of its varied ecosystems and habitats, India is home to a number of indigenous ornamental species. Approximately 33.5% of India's flora has been classified as indigenous, and it is mostly found in Peninsular India and the Indian Himalayas. One of the key factors determining plant biodiversity and conservation priorities is species endemism. An estimated 1,500 (almost 38%) of the 4,000 flowering plant species known to exist in the Western Ghats are endemic (Nair and Daniel, 1986). Due to habitat loss and related fragmentation, many endemic plants are in danger of going extinct, especially in the tropics. The largest danger to cactus (Goettsch et al. 2015), orchids (Phelps and Webb 2015), cycads, and ornamental plants in many other groups is collecting for the horticultural trade and private collections (Sharrock et al. 2014). Rapid urbanisation, deforestation, and human-caused pollution are all contributing to the worrisome rise in pollution, which is also endangering vegetation. *Strobilanthes kunthianus*, colloquially referred to as "Neelakkurinji," is the plant that gives the Neelgiri (Blue Mountains) highlands their name. The blooms bloom abundantly once every twelve years. This genus produces incredibly lovely blooms and is monocarpic in nature. These species' post-flowering decline creates a great deal of flammable debris in and surrounding shola woods, making them extremely vulnerable to forest fires. Fires in these shola forests burn the seeds, which may lead to the extinction of narrow endemics.

### Status of rare, endangered and threatened Indian ornamental flora

Some rare and endemic epiphytic orchid species from Western ghats are *Aerides ringens* Fischer, *Bulbophyllum sureum* Hook. f., *Dendrobium aqueum* Lindl., *Liparis elliptica* Weight., *Rhyncostylis retusa* Bl., *Vanda testacea* Lindl., *Xenikophyton seemeanum* Reich, *Eria nana* A. Rich. etc. A total of 138 tree species belonging to 38 families have been found to be endemic to Wynad district of Kerala (Volga et al. 2013). These include *Dillenia bracteata* Wight, *Magnolia nilagirica* (Zenk.), *Goniothalamus cardiopetalus* (Dalz.) Hook. f. and Thoms, *Meiogyne pannosa* (Dalz.) Sinclair, *Miliusa nilagirica* Bedd, *Orophea uniflora* Hook. f. and Thoms, *Polyalthia fragrans* (Dalz.) Bedd, *Casearia rubescens* Dalz, *Calophyllum austroindicum* Kosterm. ex-Stevens, *Ixora elongata* Heyne ex G. Don etc. Plant collection and identification of the Rare Endangered Threatened (RET) listed climbing species of the Southern Western Ghats showed 33 species are RET species like *Ceropegia mannarana* Umam, *Gloriosa superba* L., *Celastrus paniculata* Willd., *Aganosma cymosa* G. Don, *Passiflora leschenaultii* DC etc (Sarvalingam, et al. 2016).

**Table 1: Endangered Ornamental Plants of Jammu & Kashmir Region, North-West Himalaya.** (Sharma 2008)

Name of the species	Family	Characteristics	Cause of threat
<i>Habenaria intermedia</i>	Orchidaceae	A handsome orchid found in temperate forest fringes and grassy meadows. Tuberos roots are harvested for medicine.	Habitat Loss
<i>Meconopsis aculeata</i>	Papaveraceae	Queen of Himalayan Flowers. It is locally called Gul-Neelmi because of its sky blue flowers.	Degradation of soil due to overgrazing, deforestation

<i>Eremostachys superba</i>	Lamiaceae	Ornamental herb of Nandini Wildlife Sanctuary, Sunderbani.	Anthropogenic pressure due to soil erosion, soil compaction, and loss of moisture
<i>Gentiana kurroo</i>	Gentianaceae	Handsome gentian of temperate Chir pine and oak forests which flowers during Sep-Oct.	Habitat loss, dam building, over- exploitation, forest fires, and illegal trade

Techniques for conservation. Management and use of biosphere resources that may provide long-term benefits to current generations while preserving their capacity to satisfy the demands of future generations is known as germplasm conservation. Plant biodiversity conservation is urgently needed and is a crucial component of biodiversity conservation. Based on the location of implementation, conservation plans often employ one of two approaches: in situ or ex situ. The management of species in their native environments is known as "in situ conservation." When it comes to wild species, this is the most common or conventional method of conservation. However, it is now recognized that ex situ techniques can be efficiently used to complement in situ methods, and they may represent the only option for conserving certain highly endangered and rare species (Ramsay et al. 2000)

### Conservation methods

**Botanical Gardens:** There are more than 140 botanical gardens in India, including those connected to agri-horticultural gardens, public parks, and university botany departments (Chakraverty and Mukhopadhyay 1990). About 246 rare and endangered plants from India are preserved as living plant collections in more than 38 botanical gardens; 32 of these species are included in the Indian Red Data Books (Chakraverty et al. 2003). Rafflesia, several orchids, bromeliads, nepenthes, and other insectivorous taxa, as well as aquatic species like *Victoria amazonica*, *Nymphaea gigantea*, *Nelumbo nucifera*, and *Euryale ferox*, are among the botanically significant plant species that can only be preserved in botanical gardens under ex situ conditions. In India there are very few fernaries to conserve the rare and endangered ferns eg. Kodaikanal Botanic Garden, Gurukula Botanic Garden, Nadugani Gene pool forests and National Botanical Garden.

**Arboreta:** Arboreta are designated areas used for the growth and exhibition of a large number of diverse tree and shrub species. For instance, the Ooty Arboretum in India is home to both native and alien tree species, including *Alnus nepalensis* and *Hypericum hookerianum*. Furthermore, there are 1,430 different kinds of trees at the arboretum at the Regional Plant Resource Centre (RPRC) in Bhubaneswar, Odisha (Jalli et al. 2015).

**In Vitro Conservation:** Particularly for crop species with non-traditional seeds (where seeds are susceptible to freezing or desiccation), vegetatively propagated crop species, and uncommon and endangered plant species, in vitro procedures are crucial instruments for the conservation of plant biodiversity. The manufacture and quick multiplication of high-quality, disease-free planting material are guaranteed using in vitro culture procedures. The greatest approach for long-term conservation is cryopreservation, which involves keeping germplasm in liquid nitrogen at -196 °C for lengthy periods of time while stopping all metabolic activity. The Botanical Survey of India (BSI) is a leader in the collection, preservation, and mass production of significant rare and endangered ornamental plants via the use of biotechnological instruments.

**The conservation role of protected areas:** Most environmentalists would concur that protected areas are the cornerstone of national conservation policies in the majority of nations. As long as they are properly cared for and managed, they are seen to be the principal barrier against the loss of biodiversity.

Many countries have met or are on track to meet the Aichi Biodiversity Target 11 [By 2020, at least 17 percent of terrestrial and inland water areas and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape]. The expansion of protected areas over the past 25 years to 202,000 today, which currently make up 14.7% of the world's terrestrial area, is rightfully recognised as an outstanding achievement in global conservation (Jones et al., 2018).

**Conservation benefits of protected areas:** As previously said, there is a compelling argument for a significant increase in the number of protected areas; but any expansion must be properly thought out if it is to provide particular conservation benefits that effectively address the intricate issues mentioned above. According to research by Kuempel et al. (2018), "expansion alone, without additional enforcement, can actually reduce conservation outcomes." They also found that, on average, it was more beneficial to invest more on the enforcement of already-existing protected areas rather than their expansion. This is supported by Barnes et al. (2018), who point out that there isn't much proof that growing the global network of protected areas actually improves biodiversity and contend that we should change the protected area target development's emphasis from number to quality. Similarly, a study by Pimm et al. (2018) highlights that "governments should expand their conservation focus and prioritise key habitats outside wildernesses and current protected areas" in order to "preserve biodiversity more fully, especially species with small ranges." It also emphasises that the quality of the land we protect is more important than its quantity.

## Conclusion

To preserve the planet's biodiversity, the conservation of endangered plants is a pressing and intricate issue that calls for a fusion of conventional and contemporary approaches. To protect plant species, in situ and ex situ conservation techniques provide complimentary strategies. Ex situ techniques offer vital backup in the event of significant habitat deterioration or extinction in the wild, whereas in situ conservation permits species to flourish in their original habitats, guaranteeing ecosystem balance and normal evolutionary processes. Tissue culture methods, seed banks, and botanical gardens are crucial for preserving genetic variety and facilitating reintroduction initiatives. Conservation initiatives must embrace cutting-edge technology like genetic mapping and restoration ecology to meet the ever-changing problems posed by rising environmental concerns like pollution, habitat degradation, and climate change. For the long-term preservation and sustainable use of plant resources, legal frameworks and environmental policies supported by global accords such as the Convention on Biological Diversity (CBD) are essential. Involving the community and empowering indigenous peoples are equally vital since their traditional knowledge and practices help many species be successfully conserved. Multidisciplinary collaboration between scientists, decision-makers, environmentalists, and local people is crucial for the success of these initiatives. We can build robust mechanisms that safeguard endangered plants by encouraging cooperation and placing a strong emphasis on public education and awareness. To guarantee that future generations inherit a world where biodiversity flourishes, ecosystems are stable, and the priceless advantages of plant species are maintained, a concerted worldwide effort is ultimately required.

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