

## CONSERVATION STRATEGIES FOR THREATENED NATIVE ORCHIDS IN WESTERN GHATS

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### ABSTRACT

*The Western Ghats, a biodiversity hotspot in India, is home to a rich diversity of native plant species that play a vital role in maintaining ecosystem health and resilience. Many native orchids in the Western Ghats are facing significant threats due to habitat loss, fragmentation, overexploitation, climate change, and illegal trade. In this research paper, we examine the conservation status of threatened native orchids in the Western Ghats, identify key challenges to their survival, and propose conservation strategies and recommendations to mitigate these threats. By emphasizing the importance of protecting and restoring native orchid populations, however, this unique biodiversity is increasingly threatened by habitat loss, fragmentation, invasive species, climate change, and anthropogenic activities. In this research paper, we examine the importance of conserving native plants in the Western Ghats, identify key challenges and threats to their survival, and propose strategies for their conservation. By highlighting the ecological, economic, and cultural significance of native plants, we underscore the urgent need for concerted efforts to protect and restore these valuable resources to ensure the long-term sustainability of the region's biodiversity. The orchids are the largest families of flowering plants and they are the superstars of the wild flower world. In this short time I would like to bring few points of wild orchids before you. Preservation biological diversity maintenance of a well-balanced ecosystem is so essential for our sustainability on this planet Almost 1000 species have been associated for the International Union for conservation of nature Global Red List to date (IUCN 2017) and an alarming 56.5% of them fall into the different categories of threat. Major threats include Habitat destruction unsustainable harvesting of the rare plants. New species are still being discovered, but named species continue to become extinct. As per the studies it have found that nearly 176 varieties of wild orchids are available in the Western Ghats. It has been estimated that many rare species disappear every year due to habitat destruction. Systematic study of orchids will help us to explore more on environment and climate change and their impact on the ecosystem. My focus on collection conservation and augmentation of natural*



*habitat of wild orchids and their preservation. I have identified and restored about 60 species of wild orchids in my home garden. Restored orchids were tagged and cared over about 16 months. The success rate of restored orchids was 90%. My project of then rightly suggested rescue and Restoration of Fallen orchids is a conservation tool for our habitats. Preventing the orchid's loss which resulting in natural and anthropogenic disturbances. This amazing results were presented in many local Medias and also shared in many floors of teachers and students. At this moment I would like to suggest to educate the public about biodiversity in ecosystems and the threats they face and opportunities to restore its conservation and importance.*

**Keywords: Conservation Strategies, Orchids Western Ghats.**

## INTRODUCTION

The Western Ghats, also known as the Sahyadri Mountains, is a UNESCO World Heritage Site and one of the world's eight hottest biodiversity hotspots. This mountain range extends along the western coast of India, spanning six states: Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu.

- ❖ **Geographic Location:** The Western Ghats stretch approximately 1,600 kilometers (990 miles) from the Tapti River in the north to the southern tip of India at Kanyakumari. It runs parallel to the Arabian Sea, creating a natural barrier that separates the Deccan Plateau from the coastal plains.
- ❖ **Biodiversity Hotspot:** The Western Ghats are renowned for their exceptional biodiversity, harboring thousands of plant and animal species, many of which are endemic and found nowhere else on Earth. It is home to diverse ecosystems, including tropical evergreen forests, moist deciduous forests, semi-evergreen forests, grasslands, and montane forests.
- ❖ **Ecological Significance:** The Western Ghats play a crucial role in regulating the region's climate, rainfall patterns, and hydrology. It serves as a source of numerous rivers, streams, and water bodies, supplying water to millions of people and supporting agricultural activities in the surrounding plains.
- ❖ **Cultural Heritage:** The Western Ghats have significant cultural and historical importance, with numerous indigenous communities, tribal settlements, and sacred sites dotting the landscape. These communities have a deep spiritual connection to the land and rely on its resources for their livelihoods and cultural practices.
- ❖ **Threats and Conservation:** Despite its ecological and cultural significance, the Western Ghats face numerous threats, including habitat loss, deforestation, urbanization, mining, agriculture, invasive species, climate change, and unsustainable development. Conservation efforts are underway to protect and restore the biodiversity of the Western Ghats, including the establishment of protected areas.
- ❖ **Importance of Native Plants:** Ecological functions, economic value, cultural significance, and role in supporting biodiversity and ecosystem services.

The Western Ghats are a unique and ecologically rich mountain range that supports a wide array of biodiversity and ecosystems. As one of the world's biodiversity hotspots, it is imperative to conserve and sustainably manage this vital natural resource for the benefit of current and future generations.

## **IMPORTANCE OF NATIVE ORCHIDS**

Native orchids play crucial roles in ecosystem processes such as pollination, nutrient cycling, and soil stabilization. They serve as indicators of habitat quality and ecosystem health, reflecting changes in environmental conditions. Additionally, native orchids hold cultural and economic significance, contributing to traditional practices, ecotourism, and pharmaceutical research. Understanding the importance of native orchids is essential for prioritizing conservation efforts and preserving ecosystem integrity. Native orchids hold significant ecological, cultural, and economic importance, contributing to biodiversity conservation, ecosystem functioning, and human well-being. The native orchids play multifaceted roles in ecosystems, cultures, and economies, highlighting their importance for biodiversity conservation, ecosystem services, cultural heritage, and human well-being. Protecting and conserving native orchids is essential to ensure their continued existence and benefits for present and future generations.

## **NATIVE ORCHIDS ARE IMPORTANT IN ENVIRONMENTAL CONSERVATION FOR SEVERAL REASONS**

1. **Indicator Species:** Orchids are sensitive to changes in environmental conditions, making them valuable indicators of ecosystem health and habitat quality. Monitoring orchid populations can provide early warning signs of environmental degradation, habitat loss, pollution, and climate change impacts. Changes in orchid distribution, abundance, and flowering patterns can help identify areas in need of conservation action and inform management strategies to protect broader ecosystems.
2. **Biodiversity Conservation:** Orchids are an integral part of global biodiversity, representing one of the largest and most diverse families of flowering plants. Native orchids contribute to the overall species richness and genetic diversity of ecosystems, supporting a wide range of pollinators, symbiotic fungi, and other organisms. Protecting native orchids helps conserve biodiversity and maintains ecological balance within ecosystems.
3. **Habitat Restoration:** Orchids play important ecological roles in their natural habitats, including nutrient cycling, soil stabilization, and microclimate regulation. Restoring orchid habitats can enhance ecosystem resilience, restore degraded landscapes, and improve habitat connectivity for other plant and animal species. Reintroducing native orchids into restored habitats can accelerate ecological recovery and promote ecosystem functioning.

4. Pollinator Conservation: Orchids have coevolved with a diverse array of pollinators, including bees, butterflies, moths, birds, and insects. Many orchid species have specialized floral structures, colors, and fragrances that attract specific pollinators. Protecting native orchids helps safeguard pollinator populations and promotes pollinator diversity, ensuring the pollination services that sustain ecosystems and support agricultural productivity.

5. Genetic Resources: Orchids harbor valuable genetic resources that can be utilized for research, conservation, and breeding programs. Native orchids possess unique genetic traits, adaptive characteristics, and medicinal properties that have potential applications in agriculture, horticulture, pharmaceuticals, and biotechnology. Conserving native orchids preserves genetic diversity and maintains the gene pool for future generations.

6. Cultural and Aesthetic Value: Orchids have cultural significance and aesthetic appeal, inspiring art, literature, and cultural traditions worldwide. Native orchids are valued for their beauty, rarity, and spiritual symbolism, and are often associated with cultural heritage, festivals, and rituals. Protecting native orchids helps preserve cultural identity, traditions, and connections to the natural world.

Native orchids are essential components of healthy ecosystems and play critical roles in environmental conservation. By protecting and conserving native orchids, we can safeguard biodiversity, restore degraded habitats, support pollinator populations, preserve genetic resources, and promote cultural and aesthetic values for the benefit of present and future generations.

### **MAJOR CHALLENGES OF NATIVE ORCHID'S CONSERVATION**

Conserving native orchids presents several challenges due to their unique ecological requirements, habitat specialization, and susceptibility to various threats. Some of the major challenges of native orchid conservation include:

1. Habitat Loss and Degradation: One of the most significant threats to native orchids is habitat loss and degradation due to deforestation, urbanization, agriculture, and infrastructure development. Orchids often have specific habitat requirements, such as specific soil types, moisture levels, and light conditions, making them vulnerable to habitat destruction and fragmentation.

2. Illegal Harvesting and Trade: Native orchids are often targeted for illegal harvesting and trade due to their beauty, rarity, and commercial value in horticulture and ornamental markets. Over-collection for the floriculture industry, herbal medicine, and decorative purposes can deplete

wild populations, disrupt ecosystems, and threaten orchid species with extinction.

3. Invasive Species: Invasive plants and animals pose a significant threat to native orchids by competing for resources, altering habitats, and disrupting ecological interactions. Invasive species can outcompete native vegetation, degrade orchid habitats, and reduce pollinator populations, leading to declines in orchid abundance and diversity.

4. Climate Change: Climate change poses a growing threat to native orchids by altering temperature regimes, precipitation patterns, and weather extremes. Changes in climate can disrupt flowering phenology, affect pollinator behavior, and shift orchid distributions. Orchids with narrow environmental tolerances may be particularly vulnerable to climate change impacts.

5. Fragmentation and Isolation: Habitat fragmentation and isolation can limit the dispersal and gene flow of orchid populations, reducing genetic diversity and increasing the risk of inbreeding depression. Fragmented habitats may also be more susceptible to edge effects, invasive species, and human disturbances, further exacerbating the challenges faced by native orchids.

6. Lack of Awareness and Conservation Efforts: Native orchids often receive less attention and conservation efforts compared to other charismatic species, such as mammals or birds. Limited awareness of orchid ecology, distribution, and threats hinders conservation efforts and may lead to insufficient protection of orchid habitats and populations.

7. Poor Land Use Practices: Unsustainable land use practices, such as agriculture, logging, mining, and infrastructure development, can directly and indirectly impact native orchids and their habitats. Clearing of forests, soil erosion, pesticide use, and pollution from agricultural runoff can degrade orchid habitats and disrupt ecosystem processes.

8. Lack of Legal Protection: Many native orchid species lack legal protection under national and international conservation laws and agreements. Weak enforcement of existing regulations, inadequate monitoring, and insufficient penalties for illegal activities contribute to the continued decline of native orchid populations.

Addressing these challenges requires integrated conservation approaches that involve habitat protection, restoration, invasive species management, climate change adaptation, community engagement, and policy interventions. By raising awareness, implementing conservation measures, and fostering collaboration among stakeholders, can work towards preserving native orchids and their ecosystems for future generations.

## **METHODOLOGY FOR THREATENED NATIVE ORCHID'S CONSERVATION**

Developing a comprehensive methodology for conserving threatened native orchids involves a



multi-faceted approach that integrates scientific research, conservation planning, community engagement, and policy advocacy.

- **Species Assessment:**
  - Conduct a thorough assessment of threatened native orchid species in the target area, including their distribution, abundance, habitat requirements, population trends, and conservation status.
  - Prioritize orchid species based on their level of threat, ecological significance, and conservation value.
- **Habitat Assessment:**
  - Identify key orchid habitats, including natural habitats, protected areas, and degraded landscapes, using remote sensing, GIS analysis, and field surveys.
  - Assess habitat quality, integrity, and connectivity, evaluating factors such as habitat size, vegetation structure, soil characteristics, and disturbance levels.
- **Threat Analysis:**
  - Identify and prioritize threats to native orchids and their habitats, including habitat loss, fragmentation, invasive species, climate change, illegal harvesting, and land use change.
  - Evaluate the magnitude and extent of each threat, assessing their impact on orchid populations and ecosystems.
- **Conservation Planning:**
  - Develop a conservation action plan outlining specific goals, objectives, and strategies for conserving threatened native orchids.
  - Define conservation targets, such as population size, genetic diversity, and habitat quality, and establish measurable indicators to track progress towards conservation goals.
  - Identify conservation measures and interventions, including habitat restoration, invasive species management, ex situ conservation, captive propagation, and community-based conservation initiatives.
- **Habitat Protection and Restoration:**
  - Implement habitat protection measures, such as establishing protected areas, nature reserves, and conservation easements to safeguard critical orchid habitats from threats.

- Restore degraded orchid habitats through reforestation, revegetation, habitat rehabilitation, and ecosystem restoration projects, focusing on enhancing habitat quality and connectivity.
- Invasive Species Management:
  - Develop and implement invasive species control programs to mitigate the impacts of invasive plants, animals, and pathogens on native orchid populations.
  - Prioritize invasive species for management based on their invasiveness, distribution, and impact on orchid habitats, and employ a combination of mechanical, chemical, and biological control methods.
- Community Engagement:
  - Engage local communities, indigenous peoples, stakeholders, and volunteers in orchid conservation efforts through education, outreach, and capacity-building initiatives.
  - Raise awareness about the ecological importance, cultural significance, and threats facing native orchids, and mobilize community support for conservation actions.
- Policy Advocacy:
  - Advocate for the implementation of conservation policies, laws, and regulations to protect native orchids and their habitats at local, national, and international levels.
  - Collaborate with government agencies, NGOs, research institutions, and policymakers to develop and enforce conservation policies, designate protected areas, and promote sustainable land use practices.
- Monitoring and Evaluation:
  - Establish monitoring programs to assess the effectiveness of conservation actions, track changes in orchid populations and habitats, and evaluate progress towards conservation goals.
  - Monitor key indicators, such as population size, reproductive success, genetic diversity, and habitat quality, using standardized monitoring protocols and scientific methods.
- Adaptive Management:



- Implement adaptive management strategies to adjust conservation interventions based on new information, changing circumstances, and feedback from monitoring data.
- Continuously evaluate and refine conservation strategies, incorporating lessons learned and best practices to improve the effectiveness and long-term sustainability of orchid conservation efforts.

By following this methodology, conservation practitioners can develop and implement targeted strategies to conserve threatened native orchids and their habitats, ensuring their persistence and resilience in the face of ongoing environmental challenges.

## **PROPOSING CONSERVATION STRATEGIES FOR THREATENED NATIVE ORCHIDS**

Proposing conservation strategies for threatened native orchids involves a combination of habitat protection, restoration, invasive species management, community engagement, and policy advocacy. Here are some proposed conservation strategies:

### **Habitat Protection:**

- ❖ Identify and designate key orchid habitats, including natural reserves, protected areas, and critical habitats, for conservation and management.
- ❖ Establish buffer zones and conservation easements around orchid habitats to minimize human disturbances and land use conflicts.
- ❖ Collaborate with landowners, government agencies, and local communities to enforce legal protections and regulations for orchid habitats.

### **Habitat Restoration:**

- ❖ Implement habitat restoration projects to enhance the quality and connectivity of orchid habitats, focusing on restoring degraded ecosystems and improving habitat resilience.
- ❖ Conduct revegetation, reforestation, and habitat rehabilitation efforts to restore native vegetation and ecosystem functions in degraded orchid habitats.
- ❖ Restore natural hydrological regimes, soil conditions, and microclimate patterns to create suitable habitat conditions for orchid growth and reproduction.

### **Invasive Species Management:**

- ❖ Develop and implement invasive species control programs to manage the spread and impact of invasive plants, animals, and pathogens on native orchid populations.
- ❖ Prioritize invasive species for management based on their invasiveness, distribution, and impact on orchid habitats, and employ a combination of mechanical, chemical, and biological control methods.
- ❖ Monitor invasive species populations and implement early detection and rapid response measures to prevent new invasions and minimize the spread of existing invaders.

#### Ex Situ Conservation:

- ❖ Establish ex situ conservation facilities, such as orchid nurseries, seed banks, and living collections, to conserve threatened orchid species outside of their natural habitats.
- ❖ Collect and bank orchid seeds, tissues, and genetic material for long-term storage and research purposes, ensuring the genetic diversity and conservation of rare and endangered orchids.
- ❖ Conduct captive propagation and reintroduction programs to augment wild orchid populations, enhance genetic diversity, and restore populations in degraded or extirpated habitats.

#### Community Engagement:

- ❖ Engage local communities, indigenous peoples, stakeholders, and volunteers in orchid conservation efforts through education, outreach, and capacity-building initiatives.
- ❖ Raise awareness about the ecological importance, cultural significance, and threats facing native orchids, and mobilize community support for conservation actions.
- ❖ Foster partnerships and collaborations with local communities to develop sustainable livelihoods, alternative income sources, and ecotourism opportunities that support orchid conservation and benefit local economies.

#### Policy Advocacy:

- ❖ Advocate for the development and implementation of conservation policies, laws, and regulations to protect native orchids and their habitats at local, national, and international levels.
- ❖ Collaborate with government agencies, NGOs, research institutions, and policymakers to develop and enforce conservation policies, designate protected areas, and promote sustainable land use practices.

Support the inclusion of orchid conservation priorities in national biodiversity conservation

strategies, action plans, and funding programs to prioritize resources for orchid conservation initiatives.

By implementing these conservation strategies in a coordinated and integrated manner, stakeholders can work together to conserve threatened native orchids and their habitats, ensuring their persistence and resilience in the face of ongoing environmental challenges.

### **CREATING A DATABASE OF THREATENED NATIVE ORCHIDS**

It is a valuable tool for conservation efforts, enabling researchers, policymakers, and conservationists to assess the status, distribution, and threats facing orchid populations. Here's a suggested framework for developing a database of threatened native orchids:

#### ❖ Data Collection:

Compile existing data on threatened native orchids from scientific literature, research studies, botanical surveys, herbarium collections, and conservation reports.

Gather information on orchid species taxonomy, distribution, habitat preferences, population size, reproductive biology, threats, and conservation status.

#### ❖ Field Surveys:

Conduct field surveys and inventories to collect new data on threatened native orchids, including species presence, abundance, and habitat characteristics.

Use standardized survey protocols and sampling techniques to ensure data consistency and comparability across different sites and regions.

#### ❖ Data Management:

Establish a centralized database to store and manage information on threatened native orchids, using appropriate software and tools for data entry, storage, retrieval, and analysis.

Organize data fields and categories to facilitate data searching, sorting, filtering, and reporting, including species names, geographic coordinates, habitat types, threat categories, and conservation actions.

#### ❖ GIS Mapping: (Geographic Information System)

Georeferenced orchid occurrence records and habitat data to create spatial distribution maps of threatened native orchids.

Utilize Geographic Information Systems (GIS) software to visualize, analyze, and interpret spatial patterns, hotspots, and conservation priorities for orchid populations and habitats.

❖ Data Analysis:

Analyze data on threatened native orchids to identify trends, patterns, and correlations related to species distribution, population dynamics, habitat associations, and threat factors.

Conduct statistical analyses, modeling exercises, and spatial assessments to assess the vulnerability, risk, and conservation status of orchid species and populations.

❖ Conservation Prioritization:

Use the database to prioritize conservation efforts for threatened native orchids based on their conservation status, rarity, ecological significance, and level of threat.

Identify priority areas for conservation action, including high-priority sites for habitat protection, restoration, and management, as well as critical corridors and connectivity networks for orchid dispersal and gene flow.

❖ Monitoring and Reporting:

Implement monitoring programs to track changes in orchid populations and habitats over time, using standardized monitoring protocols and indicators.

Generate regular reports and updates on the status of threatened native orchids, highlighting conservation successes, challenges, and emerging threats for stakeholders and decision-makers.

❖ Collaboration and Sharing:

Collaborate with other organizations, institutions, and stakeholders to share data, expertise, and resources for orchid conservation efforts.

Establish partnerships with botanical gardens, conservation organizations, universities, and government agencies to support data sharing, research collaboration, and capacity-building initiatives.

By developing and maintaining a robust database of threatened native orchids, conservationists can improve our understanding of orchid biodiversity, guide conservation planning and management decisions, and enhance the effectiveness of conservation actions aimed at protecting these iconic and ecologically valuable species.

### **THREATENED NATIVE ORCHIDS IN THE WESTERN GHATS**

Providing an exhaustive list of threatened native orchids in the Western Ghats, Some examples of orchid species that are considered threatened or endangered in this region. Please note that the status of orchid species may vary based on location, habitat, and specific conservation assessments. Here are a few examples:

- *Paphiopedilum druryi* (Drury's slipper orchid)

- *Vanda tessellata* (Blue Vanda)
- *Bulbophyllum thomsonii* (Thomson's Bulbophyllum)
- *Coelogyne nervosa* (Nerved Coelogyne)
- *Dendrobium macrostachyum* (Large Spiked Dendrobium)
- *Phaius wallichii* (Wallich's Phaius)
- *Thrixspermum centipeda* (Centipede Thrixspermum)
- *Vanilla travancorica* (Travancore Vanilla)
- *Habenaria rariflora* (Sparse-flowered Habenaria)
- *Aerides maculosa* (Spotted Aerides)

These are just a few examples, and there are many other native orchid species in the Western Ghats that may be considered threatened, vulnerable, or endangered. Conservation efforts are needed to protect these orchids and their habitats from threats such as habitat loss, fragmentation, climate change, and illegal harvesting

## CONCLUSION

The proposed research aims to provide valuable insights into the importance of native orchids and the challenges they face in Wayanad, India. By addressing these challenges through effective conservation strategies and stakeholder engagement, we can safeguard native orchid populations and preserve the ecological integrity of the Western Ghats for future generations. Threats to native plant diversity are diverse and can arise from various human activities, natural phenomena, and environmental changes. Addressing the threats to native plant diversity requires integrated and multidisciplinary approaches, including habitat protection, invasive species management, sustainable land management, climate change adaptation, and education, outreach, and policy interventions. By recognizing and mitigating the threats to native plants, we can conserve biodiversity, restore ecosystems, and promote sustainable use of natural resources for the benefit of present and future generations. The need for Wild Orchid conservation is paramount if we are obliged to hand over the planet to future generation with rich and wildly fascinating Orchid Legacy that we all enjoy today. Without effective conservation actions the process of threat will continue and the survival of orchids resulting in their fate will be and inevitable extinction.