Miyawaki Magic in Nepal – Mithila Wildlife Trust

History of the Miyawaki Method

The Miyawaki method is a technique for creating dense, native, and biodiverse forests. Developed by Japanese botanist Akira Miyawaki, this method focuses on rapid, natural forest growth.

Key aspects of the method include:

1. Native, Naturalised, or Beneficial Species – Planting a mix of native, naturalised, or beneficial (fruit, timber, medicinal) trees and shrubs that are naturally suited to the local environment.
2. Dense Planting – Trees are planted much closer together than traditional methods, leading to a compact, self-sustaining ecosystem.
3. Layered Structure – Mimics the natural forest structure with various layers (canopy, understory, ground cover) to create a diverse habitat.
4. Minimal Human Intervention – After the initial planting, the forest is largely left to grow on its own, requiring little maintenance.

The result is a rapidly growing, resilient forest that helps restore biodiversity, improves air quality, and provides numerous environmental benefits.

Figure 1 - Miyawaki plantation of two years old nearby wildlife pond

Background - Mithila Wildlife Trust

Motivated by the climate crisis and the neglect of wildlife outside protected areas (PAs), Mithila Wildlife Trust (MWT) is committed to protecting and reinvigorating the flora and fauna of southern Nepal while improving the lives of marginalized local communities.

By implementing a community-based approach to conservation, MWT aim to uplift local people and restore nature through various programs focusing on education, restoration, community support, and rescue and rehabilitation. Their goal is to mend the fractured relationship between humans and nature, creating harmony that benefits both people and wildlife.

The Need for Miyawaki-Style Reforestation in Nepal's Terai Region

Reforestation in Nepal's Terai region is essential for restoring ecological stability, protecting communities from climate extremes, and ensuring long-term environmental resilience. The Miyawaki method is an effective approach that offers several key benefits:

1. Combating Deforestation and Land Degradation
   The Terai, once home to vast subtropical forests, has suffered severe deforestation due to agricultural expansion, illegal logging, and infrastructure development. This has led to soil erosion and declining land productivity. Miyawaki forests help stabilize soil, reduce erosion, and restore degraded land faster than conventional reforestation methods.

2. Cooling Effects and Heatwave Mitigation
   Rising temperatures and extreme heatwaves are worsening in the Terai. Miyawaki forests create a cooling microclimate, increasing humidity, lowering ground temperatures, and reducing the urban heat island effect.

3. Water Cycle Regulation and Flood Prevention
   Deforestation has disrupted the Terai's natural water cycle, causing irregular monsoons, floods, and groundwater depletion. Miyawaki forests act as natural sponges, absorbing excess rainwater, reducing runoff, and helping recharge groundwater.

4. Biodiversity Restoration, Especially for Birds
   Habitat loss has reduced bird populations, including species like the great hornbill and Bengal florican. Miyawaki forests provide essential nesting sites and food sources, forming biodiversity corridors for migratory and resident birds.

5. Strengthening Community Livelihoods and Sustainable Resource Use
   Many local communities rely on forests for fuelwood, fodder, and medicinal plants. Miyawaki forests supply these resources sustainably and create employment opportunities while restoring traditional ecological knowledge.

6. Carbon Sequestration and Climate Resilience
   Miyawaki forests sequester carbon up to 10 times faster than conventional plantations, helping Nepal meet its global climate commitments while restoring ecological health.

Figure 2 - Birdwatching program organised by MWT

Miyawaki Plantation System in Dhanusa District

The Miyawaki process begins with land selection and demarcation, followed by soil filling and levelling to prevent flooding. The site is then fenced to protect against external disturbances.

Soil quality testing ensures suitability for planting, after which manure is added to enhance fertility. The planting area is marked with 20cm x 20cm pits, grouping plant species accordingly to ensure a balanced ecosystem. Once planting is complete, mulching with straw or leaves helps retain moisture and suppress weeds. Regular irrigation supports early growth, along with consistent monitoring.

Figure 3 - Recently planted Miyawaki plantation

The project also incorporates data collection, research, and educational activities to refine techniques and promote awareness of the Miyawaki method's benefits.

Miyawaki Forest Establishment and Success Rates in Dhanusa District

Mithila Wildlife Trust has pioneered the Miyawaki method to restore degraded land and enhance biodiversity in Dhanusa District. These fast-growing forests play a vital role in habitat creation, climate resilience, and ecosystem restoration.

Figure 4 - Using straw mulch to protect young seedlings from drought, and adding some organic matter fertility

Success indicators include:

- A G5% survival rate of planted trees, achieved through careful species selection, soil enrichment, and ongoing monitoring.
- The establishment of self-sustaining ecosystems within a few years, providing essential cover for birds, pollinators, and wildlife.

- MWT plantations with added wildlife ponds will help to increase survival rates of trees by creating wetter microclimates. These ponds not only help to refill groundwater aquifers, but has also attracted specialised wildlife such as Common Kingfishers (*Alcedo atthis*) and Kellback snakes (*Rhabdophi)*.

Figure 5 – Some Miyawaki plantations created by MWT also have wildlife ponds created.

Growth Rates of Miyawaki Forests in Dhanusa District

Mithila Wildlife Trust's Miyawaki plantations have demonstrated remarkable growth rates, reaffirming the method's effectiveness in rapidly restoring degraded landscapes.

Observations show:

- Year 1: Seedlings (15–20 cm) grow up to 100 cm, with trunk diameters of 6 cm.
- Year 2: Trees reach 1.5–3 meters in height, with trunk girths up to 13 cm.
- Year 3: Trees reach 4.5–6 meters, with trunks up to 20 cm in girth, forming a dense canopy.

This growth rate is 10 times faster than conventional reforestation, ensuring these forests quickly become self-sustaining ecosystems.

Figure c - One year of growth

Figure 7 - Two years of growth

The astounding growth rates seen in these Miyawaki plantations are a demonstration of the immense benefits these spaces can bring in a short space of time. In our rapidly changing climate, action needs to be taken quickly to mitigate the effects that heatwaves will have on human and wildlife communities. The Miyawaki method is the most effective way to create cooling microclimates, rejuvenate rapidly drying aquifers, and provide sanctuaries for wildlife.

Figure 8 - Three years of growth

Figure S - Small stream ffowing out from a nearby Miyawaki plantation

These photos show the results from a three-year-old Miyawaki plantation in Dhanusa District. The small streams flow is regulated by the plantation, which will hold onto moisture and prevent erosion. The Moringa tree, which attained a girth of nearly 20cm, has medicinal and nutritional properties, its young seed pods edible, and its leaves are antioxidant and anti-inflammatory and are used in traditional medicine.

Figure 10 - Incredible growth of the Moringa tree (Moringa oleifera)

Challenges and Enacted Solutions in Establishing Miyawaki Forests in Dhanusa District

While Mithila Wildlife Trust's Miyawaki plantations in Dhanusa District have shown remarkable success, several challenges have been encountered and addressed to ensure long-term sustainability. These challenges range from community conflicts to environmental pressures, and have required continuous monitoring, engagement, and adaptive management strategies.

1. Community Conflicts and Human Interference

Some sites have faced littering and fence vandalism. Now that sites are becoming more established, and community members are seeing the benefits of the project this has reduced.

Figure 11 – Fence Vandalism

2. Grazing Pressure from Livestock

Goat browsing and other livestock is a major threat to young Miyawaki plantations. Fence vandalism can allow opportunities for grazing, which is highly detrimental to young plantations. Engagement with local herders to prevent this from occurring will reduce this issue which has not been regular. Agroforestry projects may be an interesting way of providing alternatives for goat herders to disincentivise unregulated grazing within the plantations

Figure 12 – Small area that has suffered due to goat browsing

3. Soil and Water Constraints

Some plantation areas suffer from low soil fertility and compaction, slowing down initial growth rates. Water Availability: In dry seasons, sustaining adequate irrigation for young saplings can be challenging. Organic soil amendments such as compost, mulch, and green manure have been used to help improve soil fertility and boost plantation growth.

4. Extreme Weather and Climate Factors

Rising temperatures in Dhanusa increase evaporation rates, stressing young trees. Using the Miyawaki method's natural density advantage, which encourages trees to support each other as they grow, the Miyawaki plantation may still be stressed, but is more resilient than other methods of reforestation. Soil moisture levels are monitored, and irrigation schedules are matched to mitigate drought effects.

Wildlife and Human Benefits

The Miyawaki plantations have already demonstrated remarkable benefits for both humans and wildlife. Even within a brief ten-minute survey, MWT and I recorded over 15 species of birds vocalizing within the dense thickets, indicating a thriving avian community. Among them were species typically associated with mature forests, suggesting that the plantation is rapidly developing structural complexity suitable for diverse wildlife.

Figure 13 – King Cobra ecdysis (shedding) found in Miyawaki plantation of two years

Figure 14 – Large colony of bees

Invertebrate activity was abundant, with a variety of pollinators, beetles, and other arthropods observed foraging within the leaf litter and canopy. This flourishing invertebrate population provides a vital foundation for the broader food web, supporting birds, amphibians, and reptiles. Notably, we found clear evidence of snake activity, including the presence of the King Cobra (*Ophiophagus hannah*), a keystone predator in the ecosystem. The dense vegetation of the Miyawaki forest offers essential cover and hunting grounds for such species, reinforcing its role as a crucial habitat.

Figure 15- Fishes in stream

Nearby, we observed a large colony of bees thriving within a veteran tree, emphasizing the importance of mature trees in supporting complex ecological interactions.

Figure 16 – Foraging bees in the Miyawaki plantation

Figure 17 – Birds overhead

As the Miyawaki plantation ages, it will develop similar structural diversity, with older trees

providing nesting sites, deadwood habitat, and increased foraging opportunities for a range of species.

Additionally, we observed fish in nearby water bodies, a critical food source for kingfishers. The Common Kingfisher (*Alcedo atthis*) has been previously recorded in MWT's rewilding projects, and the presence of fish in this area suggests that these fast-growing forests are helping to restore vital aquatic and riparian ecosystems.

Given more time for observation, it is certain that many more species would be recorded within the plantation, from small mammals to nocturnal insects. The rapid development of ecological interactions within these plantations highlights their immense potential for biodiversity restoration, carbon sequestration, and habitat connectivity in fragmented landscapes.

Beyond their ecological benefits, the plantations also provide direct value to local communities through the inclusion of fruit-bearing and medicinal plant species. Trees such as moringa (*Moringa oleifera*), lemon (*Citrus limon*), and shrubs like lemongrass (*Cymbopogon citratus*) contribute to food security and traditional medicine. Moringa, often referred to as the "miracle tree," is highly valued for its nutrient-rich leaves, seeds with water-purifying properties, and its bark and roots, which have anti-inflammatory and antimicrobial applications. Lemon trees provide not only vitamin C-rich fruit but also bioactive compounds in their leaves and peel, used for digestion and immune support. Lemongrass, known for its essential oils, has potent antimicrobial and antifungal properties, serving as a natural insect repellent while also being used in teas to aid digestion and reduce fever.

Figure 18 – Seedling nursery

Here is where all the Miyawaki magic starts—this tree nursery is the foundation of future forests, where native species are carefully nurtured before being planted to restore biodiversity and support wildlife. The young trees, assorted in neat rows, represent a diverse mix of fast-growing pioneers, nitrogen-fixers, and long-lived canopy species, each playing a crucial role in building a resilient ecosystem. From here, they will be transplanted into degraded landscapes, rapidly transforming barren soil into dense, self-sustaining forests that provide habitat, improve air quality, and benefit local communities for generations to come.

Conclusion

The Miyawaki forests established by Mithila Wildlife Trust stand as a testament to the power of ecological restoration. Their rapid growth, resilience, and ability to support biodiversity highlight the method's potential in addressing deforestation, climate instability, and habitat loss. From cooling microclimates to thriving wildlife populations, these plantations have already demonstrated their value in restoring the ecological balance of Nepal's Terai region.

Figure 19: A Common Kingfisher recorded after restoration

Despite challenges such as grazing pressure and environmental stressors, the commitment of MWT and local communities has ensured the success of these forests. Their careful implementation of soil enhancement, irrigation, and community engagement strategies has not only improved tree survival rates but also fostered a deeper appreciation for conservation within the region.

My time with Mithila Wildlife Trust has been an enriching experience, and I am deeply grateful for their hospitality, knowledge, and dedication to ecological restoration. I came as a volunteer and a friend, and I leave with immense respect for the work they do. These forests, still in their infancy, hold the promise of a greener, more resilient future for both people and wildlife.

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