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From leafy to leafless: a reflection on *Metasequoia glyptostroboides* and temporal ecological adaptation in Tsukuba, Japan

Abstract

This reflective paper explores the ecological principle of temporal adaptation through personal observation of the deciduous conifer *Metasequoia glyptostroboides* during autumn in Tsukuba, Japan. Observations made between early and late November 2017 illustrate the species' phenological transition from leafy to leafless, which is clearly a survival strategy driven by climatic conditions. By connecting ecological processes with personal academic transformation, the reflection highlights how immersive experiences enhance ecological understanding far beyond traditional text books. This blend of scientific insight and personal growth reinforces the value of experiential learning in environmental education.

Keywords: *Metasequoia glyptostroboides*, phenology, temporal adaptation, experiential ecology

Volume 10 Issue 3 - 2025

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Received: October 10, 2025 | **Published:** December 02, 2025

Introduction

My personal academic visit at Tsukuba in Japan has always been a cherishing moment for me. First, a rather bigger than normal courage was needed because all the experiences there were first-timers. The excitement and the passion to learn from the National Institute for Environmental Studies (NIES) at Tsukuba served as a stepping stone and a moving motivation for me to pursue higher academic achievements. From the falling tree leaves of the landscape offered an ever-provoking and reflective view of nature's rhythms. It reminded me of a crucial ecological truth: if a tree wants to survive, it must shed its leaves when the temperature drops. Otherwise, it will not endure the next cycle of seasons. This realization was a true eye-opener, something I would never have fully grasped from reading textbooks alone, which often feel dull and mechanical that are merely facts memorized to pass with flying colours, rather than truths felt and experienced.[1]

Ecological education often emphasizes abstract concepts such as adaptation, succession, and phenology. However, without real-world immersion, these principles may remain theoretical and disconnected from learners' personal understanding. One such principle of temporal adaptation, describes how organisms respond to time-based environmental changes for survival and reproduction. While textbooks illustrate these dynamics through figures and data, personal observation can reveal their depth and emotional resonance.[2,3]

The presence of *Metasequoia glyptostroboides* (Family: Cupressaceae) as a planted ornamental in Tsukuba's urban parks and along roadsides is consistent with its documented introduction and successful cultivation in Japan and with regional climate suitability. After its mid-twentieth-century rediscovery, *Metasequoia* was widely distributed for horticulture, and Japan is specifically noted among countries where the species was deliberately established outside its native range.[4] Detailed mensuration of Japanese plantations shows the tree's rapid growth, predictable allometry, and substantial above-ground biomass accumulation, characteristics that make it attractive for amenity planting where quick canopy establishment and architectural form are desired.[5] Moreover, paleoecological syntheses of Japan's Cenozoic vegetation indicate long-standing warm-temperate forest conditions, helping to explain the ecological compatibility of this deciduous conifer in contemporary lowland settings of the Kanto region, where Tsukuba is located.[6]

Taken together, the species' documented performance in Japanese plantations,[5] its post-rediscovery horticultural dissemination in Japan,[4] and the broader climatic–floristic context support its present use as an urban park and roadside tree in Tsukuba.[6]

The objective of this reflective paper is to explore the ecological principle of temporal adaptation through the lens of my own firsthand experience observing *M. glyptostroboides* in Tsukuba during the autumn of 2017. By linking these ecological changes to personal academic growth, I aim to demonstrate how immersive, place-based learning fosters a more meaningful understanding of natural systems that can bridge scientific knowledge with emotional insight and identity.

Personal observation and understanding of the ecological principle

On 5th November 2017, the *M. glyptostroboides* trees (Family: Cupressaceae) lining the streets of Tsukuba displayed dense, richly coloured leaves, glowing in hues of orange and red under a clear sky (Figure 1). By 21st November 2017, the same trees stood bare and leafless, their skeletal branches stark against the cool autumn air (Figure 2). This rapid change was not merely aesthetic, it was ecological. The shedding of leaves reflects a critical phenological response to decreasing temperatures and light availability, ensuring water conservation and survival during winter dormancy.[7,8]

The *M. glyptostroboides*, once thought extinct, is now widely recognized for its ecological plasticity and resilience across temperate climates.[9] Its temporal adaptations are governed by climatic signals, particularly the mean diurnal range and minimum winter temperatures, which influence leaf colouring and senescence.[10,11] The observed transformation in Tsukuba reaffirmed this ecological truth: adaptation is a visible and active process.

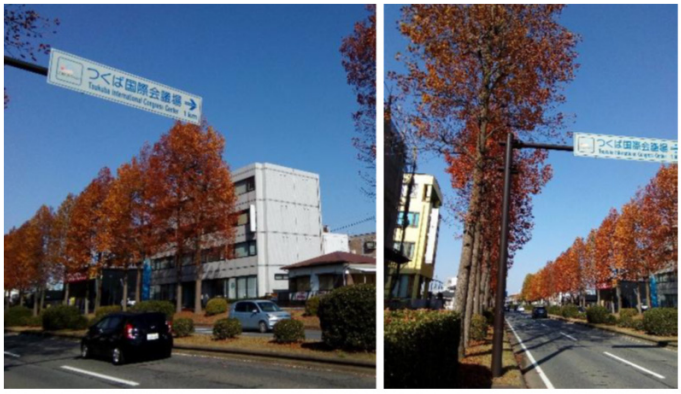

Figure 1 Seasonal landscape in Tsukuba, Japan, showing a street lined with dawn redwood trees (*Metasequoia glyptostroboides*, Family: Cupressaceae) a rare deciduous conifer species.

Captured on 5th November 2017, the image depicts the trees in early autumn with their characteristic red-orange foliage still firmly attached. This scene illustrates the pre-dormancy phase, marking the onset of ecological adaptation in response to seasonal cues. Note: Photo was original taken by myself.

Figure 2 The same *Metasequoia glyptostroboides* trees photographed on 21st November 2017, now largely leafless as part of their natural deciduous cycle.

This visible phenological shift represents an ecological adaptation strategy in deciduous conifers, where foliage is shed to conserve energy and water during winter. Note: Photo was original taken by myself.

Personal insights and thoughts

This striking natural event resonated deeply with my own academic and emotional state. Visiting Japan as a foreign scholar required courage and adjustment with new routines, cultural norms, and academic expectations. Just like the trees responding to the environment, I too was adapting. The leafless trees symbolized not loss, but readiness: shedding the unnecessary to endure the season ahead.

Unlike the passive memorization often required in traditional ecology courses, this experience illuminated the essence of adaptation: an inner core remains stable while the outer form changes in response to the environment. It confirmed my belief that direct engagement with nature fosters deeper ecological awareness than textbook learning ever could.[12]

Furthermore, I understood how climate change may complicate such adaptations. The phenology of *M. glyptostroboides* is already shifting, with delayed leaf colouring in urban areas due to the heat island effect and extended growing seasons from warming trends.[7,13] Such transformations serve as living indicators of broader environmental changes and call for both scientific attention and emotional reflection.

Conclusion

The autumnal shift from leafy to leafless in *M. glyptostroboides* became a metaphor for temporal adaptation and personal growth. As a biologist and educator, I realized that immersive experiences in ecological settings unlock a richer understanding of nature's rhythms and our place within them. Tsukuba's silent, shedding trees taught me more than lectures ever could, that adaptation requires letting go, but never losing our core identity. In teaching ecology, ecotoxicology, limnology and ecosystem management, I now encourage students to move beyond rote learning and seek direct engagement with the systems we study. After all, we too are ecosystems in motion, shaped by change but rooted in resilience.

Acknowledgements

None.

Conflicts of interest

The authors declare that there are no conflict of interest.

References

1. Chapman JL, Reiss MJ. *Ecology: Principles and Applications*. 2nd ed. Cambridge University Press; 1999.
2. Williams CJ, LePage BA, Vann DR, et al. Structure, allometry, and biomass of plantation *Metasequoia glyptostroboides* in Japan. *For Ecol Manage.* 2003;180(1-3):287–301.
3. Vann DR. Physiological ecology of *Metasequoia glyptostroboides* Hu et Cheng. In: Williams CJ, Vann DR, Basinger KS, eds. *The Geobiology and Ecology of Metasequoia*. Springer; 2005:305–333.
4. LePage BA, Yang H, Matsumoto M. The evolution and biogeographic history of *Metasequoia*. In: LePage BA, Williams CJ, Yang H, eds. *The Geobiology and Ecology of Metasequoia*. Springer; 2005.
5. Williams CJ, LePage BA, Vann DR, et al. Structure, allometry, and biomass of plantation *Metasequoia glyptostroboides* in Japan. *For Ecol Manage.* 2003;180(1-3):287–301.
6. Momohara A. Cenozoic history of evergreen broad-leaved forest in Japan. *National Historical Research: Special Issue, National Science Museum, Tokyo.* 1997;4:141–156.
7. Xiaoyi X, Mengyuan Z, Xiaolu L, et al. Spatial heterogeneity in leaf coloring date and the phenological response to thermal environment variations of Beijing landscape trees. *J Beijing For Univ.* 2024;46(1):119–130.
8. Zhao Z, Wang Y, Zang Z, et al. Climate warming has changed phenology and compressed the climatically suitable habitat of *Metasequoia glyptostroboides* over the last half century. *Glob Ecol Conserv.* 2020;23:e01140.
9. Vargo LJ, Wiles G, Wiesenberg N, et al. Climate response of *Metasequoia glyptostroboides* inferred from tree rings, Secrest Arboretum, Wooster, Ohio, USA. *Ohio J Sci.* 2020;120(2):22–29.
10. Zhang X, Wei H, Zhang X, et al. Non-pessimistic predictions of the distributions and suitability of *Metasequoia glyptostroboides* under climate change using a random forest model. *Forests.* 2020;11(1):62.
11. Li M, Sun Y, Yang Y, et al. Impacts of climate change and human activity on the habitat distribution of *Metasequoia glyptostroboides*. *Ecol Evol.* 2025;15(4):e71269.
12. Loidi J, Navarro-Sánchez G, Vynokurov D. Climatic definitions of the world's terrestrial biomes. *Veg Classif Surv.* 2022;3:231–271.
13. Zhu YY, Xu XT. Effects of climate change on the distribution of wild population of *Metasequoia glyptostroboides*, an endangered and endemic species in China. *Chin J Ecol.* 2019;38(6):1629.

Citation: Yap CK. From leafy to leafless: a reflection on Metasequoia glyptostroboides and temporal ecological adaptation in Tsukuba, Japan. *MOJ Biol Med.* 2025;10(3):169–170. DOI: 10.15406/mojbm.2025.10.00258