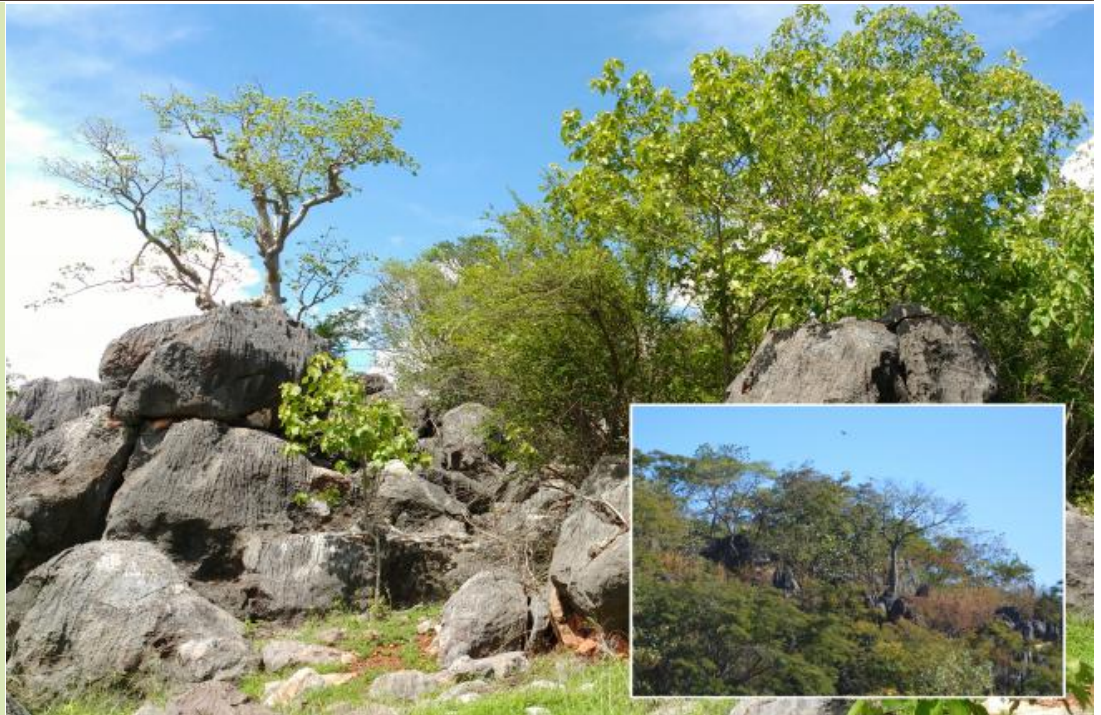


Australia's Seasonally Dry Tropical Forests need attention

Synthesis by DYP Tng, Federal University of Bahia, DMG Apgaua, SGW Laurance, James Cook University, and DMJS Bowman, University of Tasmania

- Seasonally dry tropical forests are gaining international prominence as an endangered biome, but their status in Australia is underappreciated
- These forests often occur in unusual landscape settings and harbor unique and threatened biodiversity. The original extent of these forests is reduced and greater public awareness of their international significance and conservation value is needed
- Research is still needed to properly delimit these forests and to understand their resilience to climate change and other threats



Profile of a putative Seasonally Dry Tropical Forest in semiarid northeast Australia. Inset: A visually similar forest in the Brazilian semiarid region

Seasonally dry tropical forests are among the least studied of tropical forests. However, in recent years these forests have become recognized as an endangered global biome of great economic and cultural importance. Despite this recognition, their status, range, and ecological value in Australia is still poorly appreciated, possibly because they are perceived to be species-poor derivatives of rainforests, and it has proved difficult to define and map their geographic extents.

In Australia, seasonally dry tropical forests grow in Western Australia, Northern Territory, Queensland and New South Wales, and they are often associated with unusual landforms like karsts, sandstone ravines and tablelands. These forests often exhibit dry-season deciduousness and unlike savanna, seasonally dry tropical forests harbor few grasses and they are fire-sensitive. Curious lifeforms such as bottle-shaped trees, prickly plants, and thicket-forming vines are also conspicuous in some areas.

Misleading local terms used to describe these forests, such as “Brush”, “Scrub” and “Vine thickets”, and confusingly “Dry rainforest” impedes development of national and global perspectives on the ecology and conservation status of these unique plant communities. Moving beyond local terms and seeing these forests as part of a global seasonally dry tropical forest biome will promote greater public awareness of their conservation value.

In Australia, around 75% of the original extent of these forests has been cleared. Although now largely protected, these forests still face various threats that often work synergistically, such as climate change, fire damage, mining, livestock damage and weed infestation. Ecological and biogeographical studies are therefore urgently needed to understand the resilience of seasonally dry tropical forests to multiple threats and to inform their conservation.

Research on this underappreciated Australian biome lags behind rainforest and savanna



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Supporting Evidence

Title	Aim	Key Results
Apgaua, D. M. G., Santos, R. M. D., Pereira, D. G. S., Menino, G. C., D. O. Pires, G. G., Fontes, M. A. L. & Tng, D. Y. P. (2013) Beta-diversity in seasonally dry tropical forests (SDTF) in the Caatinga Biogeographic Domain, Brazil, and its implications	A vegetation study to examine the beta-diversity of dry forests in northeast Brazil, and their conservation value	The beta-diversity of seasonally dry tropical forest is high, and an often overlooked
Curran, T. J., Clarke, P. J., Bruhl, J. J. (2008) A broad typology of dry rainforests on the western slopes of New South Wales. <i>Cunninghamia</i> 10, 381–405	A proposal of typology for seasonally dry forests in New South Wales	The study identified six floristic groups, and found little concurrence with a continental scale floristic classification of rainforest on Australia
DRYFLOR., Banda-R, K., Delgado-Salinas, A., Dexter, K. G., Linares-Palomino, R., Oliveira, A., Prado, D., et al. (2016) Plant diversity patterns in neotropical dry forests and their conservation implications. <i>Science</i> 353, 1383–1387.	A meta-analysis of the floristic turnover of neotropical seasonally dry tropical forests	There is marked floristic turnover among inventories and regions, even more so than neotropical savannas, indicating that numerous conservation areas across many countries will be needed to protect the full diversity of neotropical dry forests
Fensham, R. J. (1995) Floristics and environmental relations of inland dry rainforest in north Queensland, Australia. <i>Journal of Biogeography</i> 22, 1047–1063.	A floristic analysis of seasonally dry tropical forest in inland Queensland, Australia	Eight broad floristic groups of Seasonally Dry Tropical Forests/Dry forests were found, and almost half of the flora (444 species) recorded is obligately associated with that environment.
Fensham, R. J. (1996) Land clearance and conservation of inland dry rainforest in north Queensland, Australia. <i>Biological Conservation</i> 75, 289-298.	A mapping exercise to determine the extent and conservation value of Seasonally Dry Tropical Forest/dry rainforest in north Queensland	Almost 30% of the inland Seasonally Dry Tropical Forest/dry rainforest in north Queensland has been cleared, and weeds like Lantana increase the risk of fire that can degrade these forests
Fensham, R. J., Fairfax, R. J., & Cannell, R. J. (1994) The invasion of <i>Lantana camara</i> L. in forty mile scrub National Park, north Queensland. <i>Austral Ecology</i> 19, 297-305.	An analysis of the extent of Lantana damage in an Australian seasonally dry tropical forest	Fire events killing canopy trees and also other factors like feral pig disturbance in seasonally dry tropical forest can encourage weed invasions by Lantana
Gillieson, D. (2016) Natural heritage values of the Chillagoe and Mitchell-Palmer karst and caves	To review the geomorphological and natural heritage values of the Chillagoe Mungana Caves area in north Queensland	The seasonally dry tropical forests and associated cave systems have high levels of endemicy and many of the plants are considered near threatened. Also there is mention that around 75% of the original extent of these forests have been cleared.
Miles, L., Newton, A. C., Defries, R. S., Ravilous, C., May, I., Blyth, S., Kapos, V., Gordon, J. E. (2006) A global overview of the conservation status of tropical dry forests. <i>Journal of Biogeography</i> 33, 491–505.	To provide an overview of the conservation status of global dry forests	The study produced a global distribution map of tropical dry forest derived from the recently developed MODIS Vegetation Continuous Fields product. The study also estimated 1,048,700 km ² of tropical dry forest remains. Relevant to the topic, Australasian and Asian dry forest make up only about 4% of the global tropical dry forest
Moro, M. F., Eimear, N. L., de Araújo, F. S., Martins, F. R. (2016) A phytogeographical metaanalysis of the semiarid Caatinga Domain in Brazil. <i>Botanical Reviews</i> 82, 91–148.	To provide a phytogeographical meta-analysis of Brazilian dry forests	This work established a premise for supporting seasonally dry tropical forest in Brazil as part of a global dry forest biome
Ondei, S., Prior, L. D., Williamson, G. J., Vigilante, T., & Bowman, D. M. (2017) Water, land, fire, and forest: Multi scale determinants of rainforests in the Australian monsoon tropics. <i>Ecology and Evolution</i> 7, 1592-1604.	To map the monsoon forests of Kimberley and to understand their environmental correlates	The results corroborate previous studies that attribute moist climate, infrequent fires, and geology as important stabilizing factors that allow monsoon forest fragments to persist in savanna landscapes.
Ratnam, J., Bond, W. J., Fensham, R. J., Hoffmann, W. A., Archibald, S., Lehmann, C. E., Anderson, M. T., Higgins, S. I., Sankaran, M. (2011) When is a 'forest' a savanna, and why does it matter?. <i>Global Ecology and Biogeography</i> 20, 653-660.	To review the classification of forest and savanna, and especially to distinguish mesic savanna from forests	The paper makes an important distinction between mesic savannas and forest, the latter of which is characterized by fire sensitivity
Reis, G. H., Terra, M. C. N. S., Tng, D. Y. P., Apgaua, D. M. G., Coelho, P. A., Santos, R. M., Nunes, Y. R. F. (2017) Temporal vegetation changes in a seasonally dry tropical forest enclave in an ecotonal region between savanna and semiarid zones of Braz	To study the short term temporal dynamics of tree communities in a seasonally dry tropical forest in northeast Brazil	Vegetation dynamics of seasonally dry tropical forests are not well studied, and in this study it was found that the recruitment of the interior of seasonally dry tropical forests can be high.
Särkinen, T., Iganc, I. J. R., Linares-Palomino, R., Simon, M. F., Prado, D. E. (2011) Forgotten forests-issues and prospects in biome mapping using Seasonally Dry Tropical Forests as a case study. <i>BMC Ecology</i> 11, 27.	To review the biome maps of South America, with an emphasis on mapping seasonally dry tropical forest	A new refined working map of South American seasonally dry tropical forest biome is proposed, based on a Biome Distribution Modelling approach where georeferenced herbarium data is used in conjunction with bioclimatic data

Title	Aim	Key results
Sunderland, T., Apgaua, D., Baldauf C., Blackie R., Colfer, C., Cunningham, A. B., Dexter, K., Djoudi, H., Gautier, D., Gumbo, D., Ickowitz, A., Kassa, H., Parthasarathy, N., Pennington, R.T., Paumgarten, F., Pulla, S., Sola, P., Tng, D., Waeber, P., Wilm	To provide a global overview of dry forests	A review that emphasizes the economical, cultural and ecological importance of dry forest. The existence dry forest types in Australia, and the lack of knowledge on these forests is acknowledged.