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Williams A. 2010. Current nursery practice with regard to mycorrhizae and the propagation of New Zealand's native plants. Ecological management & restoration 11(3): 220-223.

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decline of plant taxa, and fire histories should be adjusted to include the possible effects of severe drought in fire planning.

References

Australian Greenhouse Office (2003) *Climate Change: An Australian Guide to the Science and Potential Impacts* (ed. A. B. Pittock). Australian Greenhouse Office, Canberra, ACT.

Bradstock R. A. and Kenny B. J. (2003) An application of plant functional types to fire management in conservation reserves in south-eastern Australia. *Journal of Vegetation Science* **14**, 345–354.

Cary G. J. (2002) Importance of a changing climate for fire regimes in Australia. In: *Flammable Australia: The Fire Regimes and Biodiversity of a Continent*. (eds R. A. Bradstock, J. E. Williams and A. M. Gill) pp. 26–46. Cambridge University Press, Cambridge, UK.

Clarke P. J. and Fulloon L. (1997) *Fire and Rare Plants: Torrington State Recreation Area*. University of New England, Armidale, NSW.

Clarke P. J. and Knox K. J. E. (2002) Post-fire response of shrubs in the tablelands of eastern Australia: do existing models explain habitat differences? *Australian Journal of Botany* **50**, 53–62.

Croft P., Hunter J. T. and Reid N. (2007) Depletion of regenerative bud resources during cyclic drought: what are the implications for fire management? *Ecological Management and Restoration* **8**, 187–192.

Davidson N. J. and Reid J. B. (1989) Response of eucalypt species to drought. *Australian Journal of Ecology* **14**, 139–156.

Department of Environment and Climate Change (2009) *Annual Report 2008–09*. Department of Environment and Climate Change, Sydney, NSW.

Department of Environment and Conservation (2005) *Kings Plains National Park Fire Management Strategy*. Department of Environment and Conservation, Armidale, NSW.

Gill A. M. (1981) Adaptive responses of Australian vascular plant species to fire. In: *Fire and the Australian Biota*. (eds A. M. Gill, R. H. Groves and I. R. Noble) pp. 243–270. Australian Academy of Science, Canberra, ACT.

Hunter J. T. (1997) *Acacia williamsiana* (Fabaceae: Juliflorae): a new granitic outcrop species from northern New South Wales. *Journal of the Royal Society of Western Australia* **80**, 235–237.

Hunter J. T. (2000a) *Vegetation of Kings Plains National Park*. A report to the NSW National Parks and Wildlife Service.

Hunter J. T. (2000b) *Vegetation of Severn River Nature Reserve*. A report to the NSW National Parks and Wildlife Service.

Hunter J. T. (2003) Persistence on inselbergs: the role of obligate seeders and resprouters. *Journal of Biogeography* **30**, 497–510.

Hunter J. T. (2005) Floristics and distribution of wattle dry sclerophyll forests and scrubs in north-eastern New South Wales. *Cunninghamia* **9**, 317–323.

Keith D. (1996) Fire-driven extinction of plant populations: a synthesis of theory and review of evidence from Australian vegetation. *Proceedings of the Linnean Society of New South Wales* **116**, 37–78.

Lawler S., Brown S., Edney G., Howlet S. and Love P. (1998) Buffalo Sally at the Back Wall: an alpine species adapted to fire and drought. *Victorian Naturalist* **115**, 205–209.

Marod D., Kutintara U., Tanaka H. and Nakashizuka T. (2004) Effects of fire and drought on seedling survival and growth under contrasting light conditions in a seasonal tropical forest. *Journal of Vegetation Science* **15**, 691–700.

McCarthy G. (2002) *Overall Fuel Hazard Guide—Sydney Basin*. National Parks and Wildlife Service, Sydney, NSW.

Morgan J. W. (2004) Drought-related dieback in four subalpine shrub species, Bogong High Plains, Victoria. *Cunninghamia* **8**, 326–330.

van Nieuwstadt M. G. L. and Sheil D. (2005) Drought, fire and tree survival in a Borneo rainforest, East Kalimantan, Indonesia. *Journal of Ecology* **93**, 191–201.

NSW Scientific Committee (2000) *Ecological Consequences of Frequent Fire Key Threatening Process Final Determination*. NSW Scientific Committee, Sydney, NSW.

Pittock A. B. (2005) *Climate Change: Turning Up the Heat*. CSIRO Publishing, Collingwood, Vic.

Whelan R. J., Rodgerson L., Dickman C. R. and Sutherland E. F. (2002) Critical life cycles of plants and animals: developing a process-based understanding of population changes in fire-prone landscapes. In: *Flammable Australia: The Fire Regimes and Biodiversity of a Continent*. (eds R. A. Bradstock, J. E. Williams and A. M. Gill) pp. 94–124. Cambridge University Press, Cambridge, UK.

Young R. R. and Croft P. H. (1986) Methods for harvesting and processing annual medic pods and sub-clover burr from trial plots. *Australasian Field Crops Newsletter* **21**, 34–36.

TECHNIQUES & METHODOLOGY

16.6

Current nursery practice with regard to mycorrhizae and the propagation of New Zealand's native plants.

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Introduction

The majority of plants form mycorrhizal associations, with the type of association dependent on the specific plant species. In New Zealand, the majority of plants develop arbuscular mycorrhizae (AM), including the Podocarpaceae, many forest angiosperms and native grasses (Baylis 1967; Crush 1973). *Nothofagus* (Hook. f.) Oerst. (Nothofagaceae) form ectomycorrhizal (ECM) associations, while Kanuka [*Kunzea ericoides* (A. Rich.) Joy Thomps.] and Manuka (*Leptospermum scoparium* J. R. Forst. and G. Forst.) (both Myrtaceae) are unusual amongst the flora by forming both (Orlovich & Cairney 2004). The biology of AM and ECM is very different; for example, AM sporulate within the soil or within plant roots, while ECM produce wind-dispersed spores from above-ground fruiting bodies (Smith & Read 2008). Furthermore, because AM access inorganic rather than organic nutrient sources, their hyphae proliferate within mineral soil; conversely ECM access more organic nutrient sources (Smith & Read 2008); thus, their hyphae proliferate within the litter layer. Mineral soil therefore contains more AM material, while leaf litter contains more ECM.

Plants with mycorrhizae can have increased growth rates compared with non-mycorrhizal equivalents, due mostly to increased soil phosphorous uptake (Smith & Read 2008). Mycorrhizae can also reduce a plant's vulnerability to disease (Whipps 2004). Application of mycorrhizae to seedlings has been demonstrated to improve establishment and early growth of restoration plants, covering grasslands (Richter & Stutz 2002), shrublands (Requena *et al.* 2001) and forests (Allen *et al.* 2005). However, while mycorrhizae can have beneficial plant effects, the association actually lies on a mutualism–parasitism continuum depending on the specific plant–fungus combination (Johnson *et al.* 1997); thus, certain mycorrhizae can reduce plant growth.