The effect of fire on the long-term dynamics of *Carissa ovata* (Currant bush)

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Abstract

Carissa ovata (Currant bush) is a major native woody weed widespread in the Burdekin and Fitzroy catchments that significantly reduces carrying capacity**.** Fire suppresses *Carissa* however there is no **l**ong-term data on its efficacy**.** We monitored the effect of two fires on *Carissa* cover on three soil types between 1999 and 2020 near Charters Towers. Fire caused significant reductions in *Carissa* cover, but cover returned to, and then exceeded pre-fire levels within six to seven years. Over the 22-year period *Carissa* canopy cover thus increased 1.8-fold on heavy clay soils but more than doubled on texture contrast soils. Drought had little effect on *Carissa* except on better drained or shallower soils where cover declined slightly. *Carissa* canopy cover also increased irrespective of the grazing strategy. These results highlight that more regular fire is required to suppress *Carissa* and the need for further research in understanding and controlling this significant native weed.

Keywords

Woody weeds, fire frequency

Introduction and Methods

Carissa ovata (Currant bush) is a major native woody weed widespread in the Burdekin and Fitzroy catchments that significantly reduces pasture production through competition. Good grazing management therefore requires a reduction in carrying capacity to mitigate further pasture condition decline. Fire suppresses *Carissa* (Back et al. 2005) however there is no long-term data on its efficacy as a control mechanism. The study was conducted on the Wambiana Grazing Trial located 70km SW of Charters Towers. Long term (111 year) mean annual rainfall is 640mm (C.V. = 40%). The site is in the *Aristida Bothriochloa* community with a range of soils including kandasols, sodosols, chromosols and vertosols (Isbell 1996). There are three soil-vegetation associations on the site: *Eucalyptus melanophloia* (silver leaf ironbark) on yellow/red kandasol, *Acacia harpophylla – Eucalyptus brownii* (brigalow-Reid River box on grey vertosols/grey earths and a *E. brownii* community (Reid River box) on brown sodosols and chromosols. The trial has five grazing strategies including heavy stocking rate (HSR), moderate stocking (MSR) and rotational spelling (R/Spell) all replicated twice (see O'Reagain and Bushell (2011) for more detail.

To investigate the change in *Carissa* cover, over 8km of permanent monitoring transects were surveyed on the box, brigalow and ironbark soil types in each of these three strategies. Cover was measured along a 100m tape stretched between steel pickets at each monitoring site. Percent cover was calculated by measuring the distance of the tape intersected by *Carissa* canopy cover between the pickets.

The site was burnt in the late dry season in October 1999 and again in October 2011 with hot fires. *Carissa* canopy cover was measured pre- and post-fire, as well as in 2015, 2016, 2018 and 2020. Rainfall was above average before and after both fires, but near or well below average between 2001-2007 and 2014-2020.

Results and Discussion

Both the 1999 and 2011 fires resulted in a large reduction in canopy cover of *Carissa*. However, plants re-sprouted and grew rapidly post-fire, as shown by the increases in canopy cover in later years. The increase in canopy cover continued to occur despite less than average rainfall. This is evident in Fig.1 where the percent canopy cover increased by 10.4% between 2015 and 2018 whilst rainfall ranged from 246mm in 2014/15 to 446mm in 2017/18.

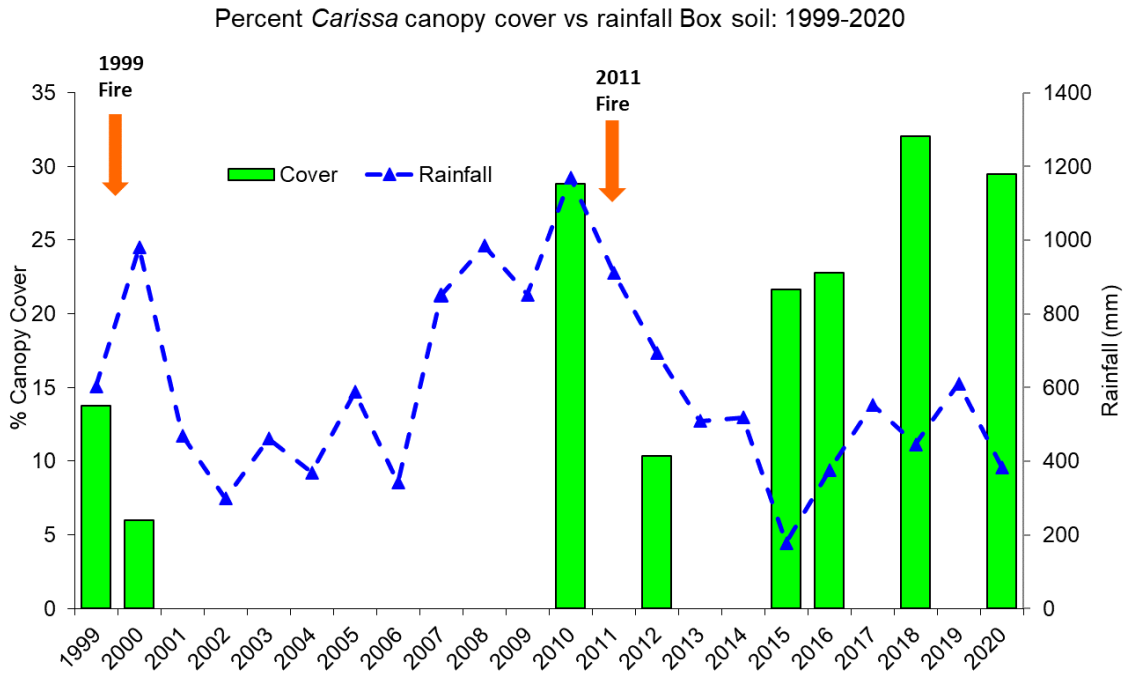

Fig.1. *Percent canopy cover versus rainfall on the box land type (data averaged across all treatments). The reduction in percent canopy cover is clear following fires in 1999 and 2011.*

Between 1999 and 2020 percent *Carissa* canopy cover has also increased from 9.7% to 13% on brigalow land types but declined on the lighter soils associated with the ironbark land type (Fig.2)

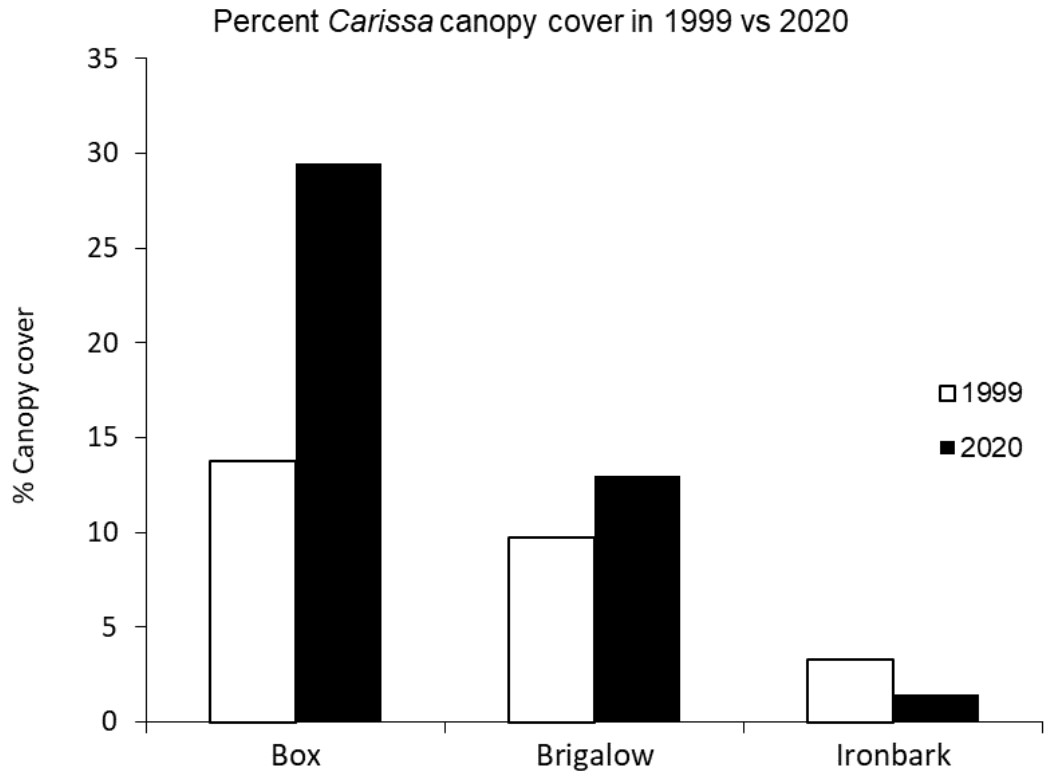

Fig.2 *Percent Carissa canopy cover at Wambiana on three land types in 1999 and 2020*

The canopy cover of *Carissa* has also increased irrespective of grazing strategy. Although canopy cover on the box land type increased most under the heavy stocking rate following the 2011 fire, canopy cover still more than doubled in paddocks which were conservatively stocked and incorporated a wet season spell.

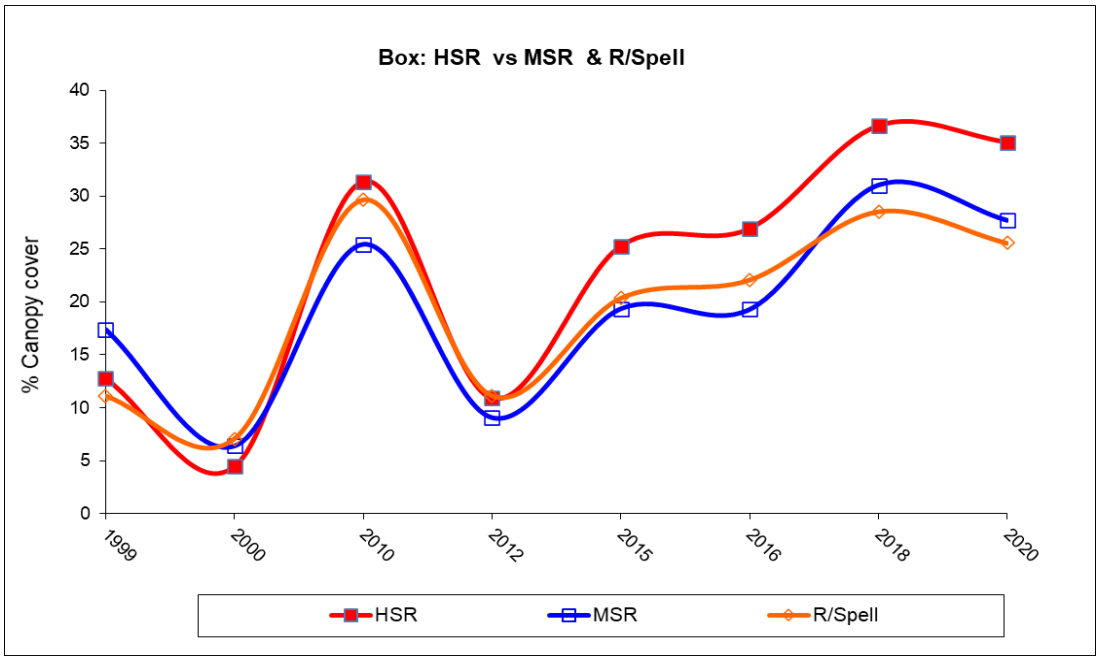

Fig.3. *Comparison of percent Carissa canopy cover on box land type in three different grazing strategies. HSR – heavy stocking rate; MSR – medium stocking rate; R/Spell – rotational spelling.*

Conclusions

These results suggest that a more frequent fire regime is required to suppress *Carissa* growth. A long-term study in the Northern Territory found that late dry season fires every four years kept woody cover increase to 4% on semi-arid woodland (Cowley et.al, 2014). Despite the variability in rainfall, average yields of >1000kg/ha were recorded in 13 of 23 years of the Wambiana Grazing Trial and therefore it expected that fuel loads would be sufficient to enable more frequent effective fires.

The results also suggest the need for further research to help understand and control this significant native weed and the local interaction between fire, woody thickening and pasture condition.

References

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