

Regrowth and recruitment of the rare shrub *Logania saxatilis* in response to fire



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Cover images (from left to right, top to bottom): *Logania saxatilis* in bud at Telowie Conservation Park; prescribed burn at Mount Remarkable in 2011; flower of *L. saxatilis*; study site at Telowie Gorge Conservation Park; study site at Mount Remarkable

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Declaration

I, Ute Susanne Grehn, certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Thesis summary

This project investigated regrowth and recruitment response of the rare shrub *Logania saxatilis* (Rock Logania) after exposure to fire. Field monitoring took place in two reserves in the Southern Flinders Ranges, South Australia: Mount Remarkable National Park (Mount Remarkable) and Telowie Gorge Conservation Park (Telowie). The two sites differed in several aspects including vegetation and fire history. Telowie had been subject to a prescribed burn approximately 18 months earlier, while a fire at Mount Remarkable was planned for the near future which offered the opportunity for both pre- and post-burn assessment. Abundance, height, vigour and leaf size of regrowth were recorded on three burnt and five unburnt sites at each reserve. Strong post-fire regrowth of *L. saxatilis* was observed on all burnt sites, while unburnt sites had less or no new growth. At Mount Remarkable, analysis by ordination of individual morphology data clearly indicated the presence of regrowth from resprouting adults and seedlings. At Telowie, on the other hand, a fairly uniform seedling population was found. This regeneration behaviour of *L. saxatilis* is consistent with a facultative resprouter. Over the two-year monitoring period, growth and mortality led to significant changes in the populations, as confirmed by ANOVA. Resprouts rapidly reached height maturity, while seedlings grew more slowly. Summer drought appeared to be the main trigger of mortality in all seedling populations. Analyses by regression and by ANOVA showed that survival was also density dependent, i.e. reduced by proximity to other seedlings and to adults. First flowering of seedlings was observed at Telowie three years after fire. The effect of fire-related changes on seed germination was researched through *in vitro* germination tests, by exposing seed to fully crossed treatment combinations with heat, smoke-water, potassium nitrate and cold stratification. Incubation took place with or without light. Counts of germinating seed at one, two and eight weeks after start of incubation were analysed with five-factor ANOVA (JMP IN 4). While several effects were interactive, of single treatments the application of smoke-water had the strongest positive effect on germination rates, being equal in effect to the combination of heat and nitrate. Light and nitrate without heat also had a positive effect, while heat without nitrate and cold stratification did not; application of all treatments led to full germination.

This research concludes that fire, and to a lesser degree other disturbances, promote germination and establishment of *L. saxatilis*. Fire, for example through lightning strikes, is a natural factor in shaping at least some of the vegetation in the Southern Flinders Ranges and evolutionary adaptation to fire occurrence can be expected. Altered fire regimes, ranging from fire exclusion to frequent burning, form a potential threat to the species. Fire exclusion, especially in absence of other

disturbances, may lead to senescence and gradual decline of some populations, while very high fire frequency may deplete the seed bank of species responding like *L. saxatilis*, and threaten population recovery, particularly when adults are lost and moisture availability is low.

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