WATTLE-IT-BE? KEY FACTORS INFLUENCING REGENERATION OF *ACACIA* AFTER BUSHFIRE.

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Background

Woody legumes, typified by wattles (*Acacia* spp.), play a central role to restore ecosystems following bushfires. When their seeds are exposed to heat they germinate quickly, helping to stabilise soil and return nitrogen (N) to the system.

A low density population can fix up to 187 kg N per hectare in a year.[1] Thus, acacias have been shown to boost net primary productivity, thereby increasing fuel production.[2]

However, their population densities have not been predictable. A recent study suggested low levels of phosphorous (P) in soil might give acacias a competitive advantage.[3] This knowledge is important to predict ecosystem resilience and fuel recovery following fire.

Aim

To investigate which soil and landscape factors favour dense recruitment of woody legumes following bushfire.

Synthesis

~ Population densities of woody legumes were highest on steeper, drier slopes – areas least conducive to hazard-reduction burns.

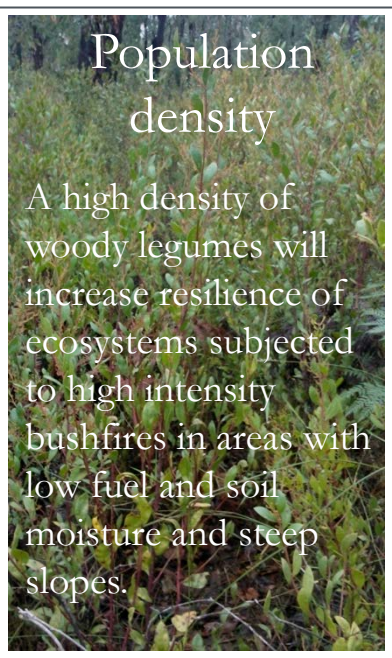
~ Some woody legumes express enzymes known to increase soil available P.

~ These species boost ecosystem resilience in marginal areas – helping to justify the decision not to prescribe-burn slopes.

End-User Statement

This research informs plans for hazard-reduction burns and highlights natural processes allowing forests to rapidly recover following bushfire.

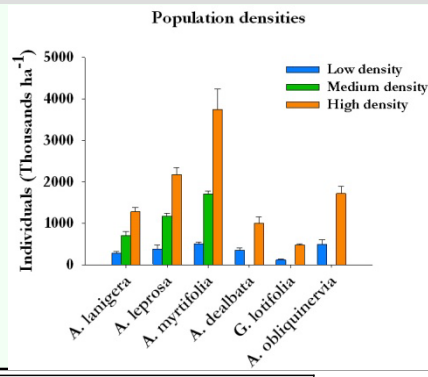
Ion Maher, Ranger in Charge, Kinglake, Parks Victoria



The accuracy of the full model to predict low versus high population density was similar when only three co-variables were used: slope, total P, and topographic wetness index (TWI).

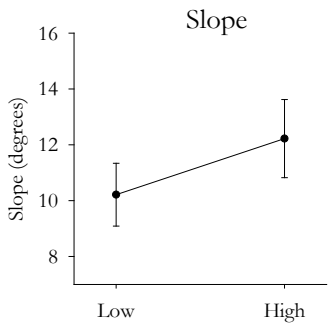
Ordinal logistic regression described a model with nine predictive co-variables. The odds ratio describes their slope relative to increasing density.

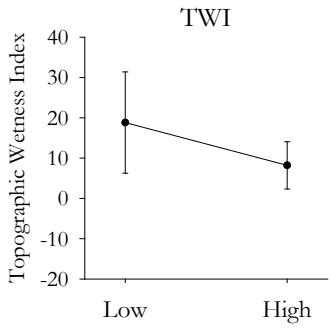
	Estimate	Odds Ratio	Sig	Model fit	Deviance	Parallelism
Model 1				< 0.001	0.8	0.131
pH	-2.31	10.07	0.01			
EC	-0.069	1.07	0.02			
Total C	-0.021	1.02	0.03			
Total P	0.005	0.99	0.03			
Percent clay	-0.078	1.08	0.01			
Solar hours, 2009	$6.366*10^{-6}$	1.00	0.01			
Slope	-0.287	1.33	< 0.01			
Aspect	-0.004	1.00	0.04			
TWI	-0.798	2.22	< 0.01			

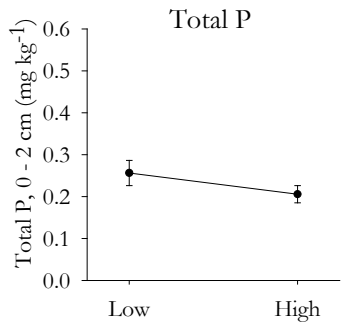


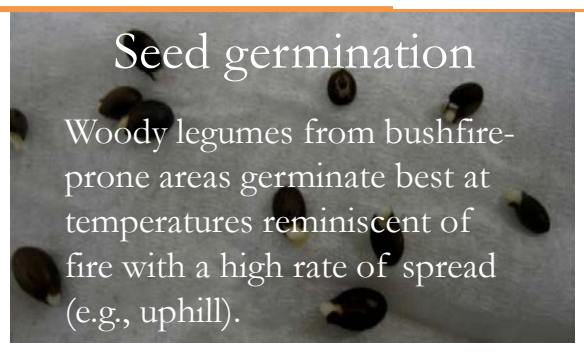
Full Model		
	Low	High
Low	74.5	25.5
High	24.1	75.9

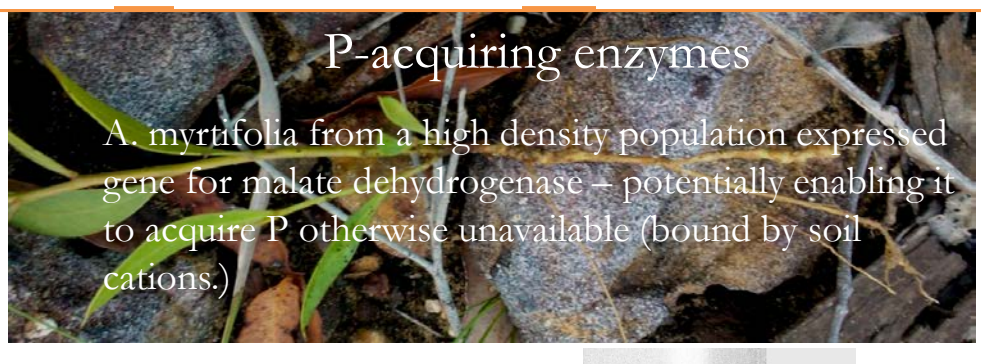
Slope, Total P, TWI		
	Low	High
Low	59.3	40.7
High	38.9	61.1

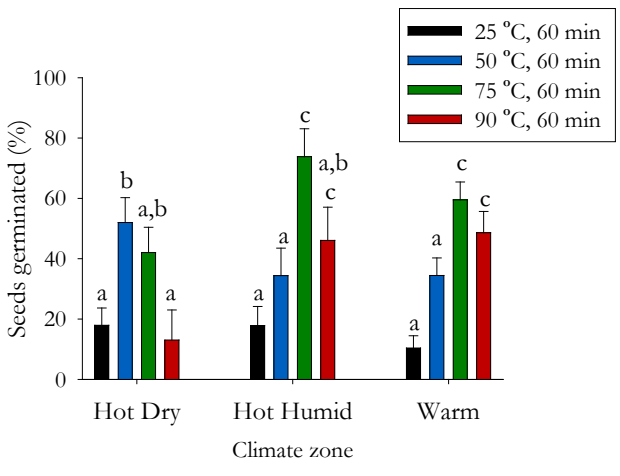




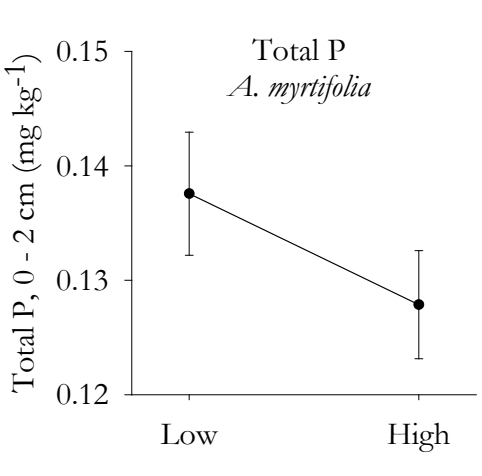


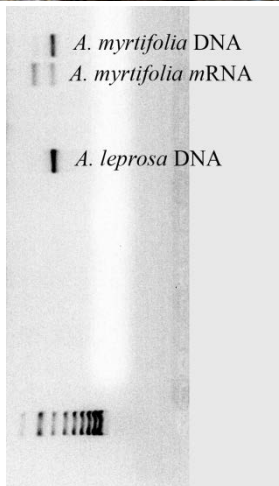






Species from arid climates germinated at temps achievable by solar irradiance. Significant difference indicated when bars have different letter.





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2. Vitousek, P.M. *et al*, **Biogeochem**, 57:1, 2002.
3. Houlton , B.Z. *et al*, **Nature**, 454:327, 2008.

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