

How simply can we describe sprouting ability?

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A widely-used simplification of vegetation response to disturbance is that species can be clearly classified as sprouters or non-sprouters. A second widely-used generalisation is that different disturbances yield equivalent species responses. This project aimed to assess how well this simple classification (sprouter / non-sprouter) described the responses of a semi-arid flora to different disturbances. The same question was also assessed using a compilation of data from the global literature reporting sprouting responses to a range of disturbances in a range of vegetation types and environmental conditions.

This work is important because these simple generalisations are used widely by ecologists, land managers and modellers but the performance of the generalisations has not been explicitly assessed.

Semi-arid NSW Species

Sprouting ability was assessed for 45 species from a range of growth forms from semi-arid NSW. We compared sprouting ability in response to clipping at stem base, and to clipping followed by scorching with a blow torch, killing buds above 6 mm below ground. The binary classification accounted for over 60 % of the deviance that was explained by species identity. Models with three or four groups were not substantially better at accounting for the responses recorded. Species responded similarly to the clipping and burning treatments.

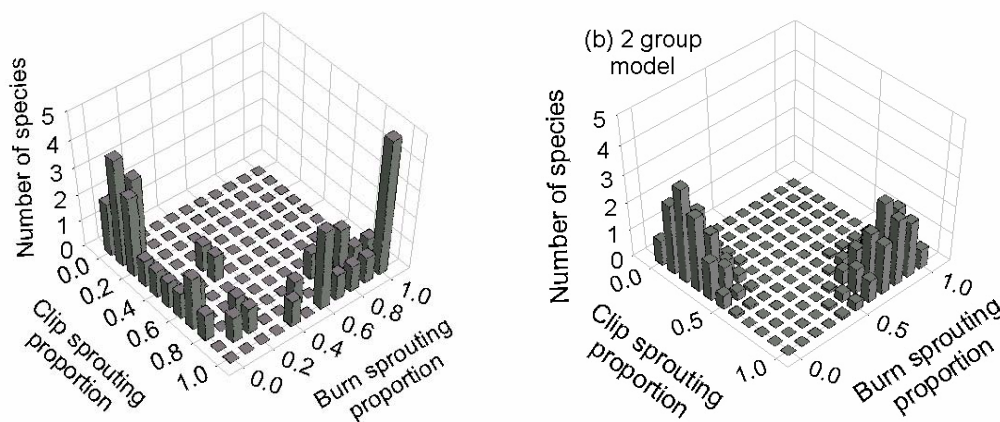


Figure 1 (a) Sprouting proportions after clipping and burning treatments between 45 species ($n = 10$ plants per treatment per species) from semi-arid NSW, Australia. Bars represent numbers of species with that particular combination of proportion of plants sprouting after clipping (x-axis) and after burning (y-axis). Looking at the floor of the graph, the eastern corner would be species with strong sprouting responses to both clipping and burning, in the south are species that are strong sprouters after clipping but weak sprouters after burning, in the west are species that are weak sprouters after both clipping and burning, in the northern corner would be species with strong sprouting after burning but weak sprouting after clipping, the northern corner is unoccupied.

(b) Expected sprouting proportions for a two-group model, using a mixture of strong sprouter (high probability) and weak sprouter (low probability) groups, each with binomial distributions. Best-fitting model parameters for weak sprouters (proportion of population, $p = 0.52$, percentage sprouting 23 % after clipping and 6 % after burning) and strong sprouters ($p = 0.48$, percent sprouting: 90 % after clipping and 79 % after burning).

Global patterns

In a compilation of over 1400 records of sprouting from 990 species, species were more strongly clustered into groups of weak and strong sprouting ability for more intense disturbances that resulted in little remaining surviving stem from which to sprout. A dichotomy of sprouting ability thus appears justified for fires, less so for catastrophic wind throw and inappropriate for gap disturbances with intact neighbours.

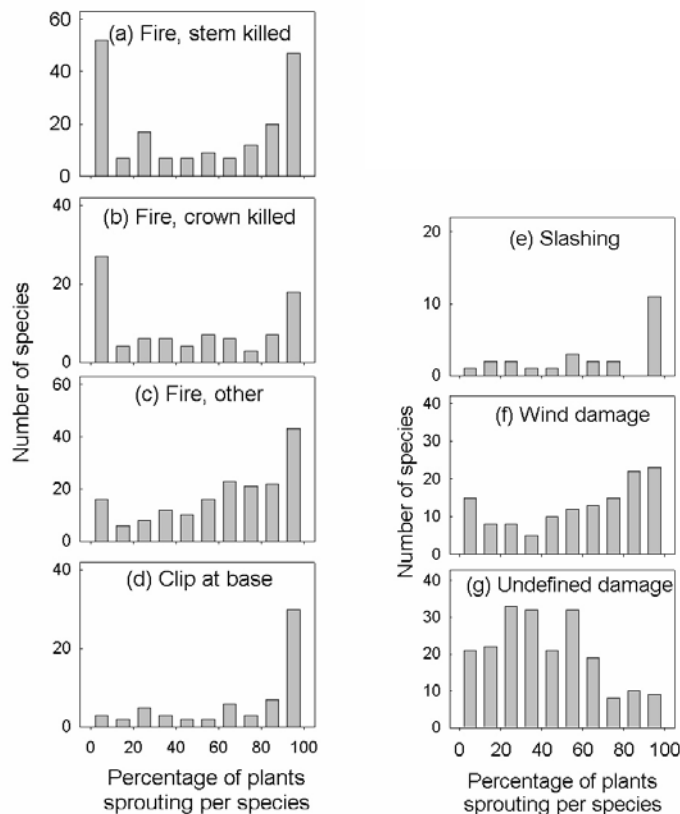


Figure 2. Frequency histograms of sprouting proportions for mature plants from different species in various disturbance classes from previously published studies: (a) plants burnt in fires or with gas torches to base or clipped to base and then burnt ($n = 185$ species), (b) plants burnt in fires or with gas torches resulting in crown kill ($n = 88$ species), (c) plants burnt in fires of lower and variable intensity ($n = 177$ species), (d) plants clipped or otherwise cut at the stem base ($n = 63$ species), (e) plants cut between 20-100 cm above the stem base ($n = 25$ species), (f) plants severely damaged by windstorms, either snapped or uprooted ($n = 131$ species), (g) plants suffering unrecorded damage to the stem ($n = 207$ species) in spatially restricted damage (gaps).