

Applied Vegetation Science (2012)

Doi: 10.1111/j.1654-109X.2012.01209.x

Proteaceae juvenile periods and post-fire recruitment as indicators of minimum fire return interval in eastern coastal fynbos

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ABSTRACT

Question: Fire management practices aimed at biodiversity conservation are often in conflict with hazard reduction requirements. Particularly in protected areas where such conflict of interest exists, the question is asked: what are the ecological thresholds within which fire should be managed?

Location: Montane proteoid fynbos shrublands, eastern coastal part of the Cape Floral Kingdom; coastal slopes of the Tsitsikamma and Outeniqua Mountains, South Africa.

Methods: Estimates of optimal fire frequencies are often based on the relationship between plant age and the rate of seed accumulation of the slowest-maturing species. We established juvenile periods and recruitment success (measured as the ratio of post-fire recruits to the pre-burn population) after fires at different intervals, of serotinous, reseeding shrubs in the Proteaceae. From this we estimated minimum fire return intervals (FRIs) that would allow for their persistence in eastern coastal fynbos shrublands.

Results: Juvenile periods ranged from 4 to 9 yr, which are comparable to ecologically similar proteoids elsewhere in fynbos and SE and SW Australian shrublands. There was large variability among sites and within species in the degree of flowering at given plant ages, some of which seemed related to the moisture regime. There were no consistent differences among species in their rate of maturation. Post-fire recruitment success was near zero following a fire in 5-yr-old vegetation, always above replacement levels following fires in ≥ 7 -yr-old vegetation, and at a maximum in old (38 yr) fynbos. There was considerable variation in post-fire recruitment success for any particular FRI, species or site. The lack of a significant relationship between recruitment success and pre-fire vegetation age, suggests that once a critical post-fire age is attained, factors other than seed abundance affect recruitment success.

Conclusions: From an ecological perspective, our findings imply a minimum FRI of 9 yr for eastern coastal fynbos. This is not intended to prescribe rigid management of fire according to a fixed rotation and does not negate the need to consider site- or species-specific requirements. Instead it provides a lower threshold for a range of acceptable FRIs below which a significant decline of species populations is predicted.