



Research Brief for Resource Managers

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Evolution and Biogeography of Epicormic Resprouting

Pausas, J.G., and J.E. Keeley. 2017. Epicormic resprouting in fire-prone ecosystems. *Trends in Plant Science* 22(12):1008-1015. <https://doi.org/10.1016/j.tplants.2017.08.010>

In fire-prone ecosystems, vegetation recovery via resprouting is an adaptive life history trait for many plant species. However, there is a difference between “basal resprouting” (i.e., when the buds are located in the root burl and insulated from heat by the soil) and the lesser known “epicormic resprouting.” In this review paper, the authors define and describe the biogeography and evolution of “epicormic resprouting,” including its mechanism of protection, the fire regimes where it occurs, and the evolutionary drivers that likely shaped the trait.

Postfire **epicormic resprouting** occurs in Australia and South Africa, as well as in California, the Mediterranean Basin and the Canary Islands in the northern hemisphere. Where crown fires do not consume the woody biomass, epicormic resprouting is an advantageous option over basal resprouting (Fig.1). Thick bark and/or sunken buds protect the epicormic buds from the heat of moderate intensity fires. This has decided advantages because the retained tree skeleton allows the canopy to recover much more quickly. Given this advantage, why haven't more trees in fire-prone environments evolved epicormic resprouting? What types of fire regimes have selected for this trait?

Management Implications

- When a tree-like skeleton is retained post-fire, **epicormic resprouting** is a faster way for vegetation to recover than either basal resprouting or obligate seeding.
- Examples of genera containing epicormic resprouting species include: *Eucalyptus*, arborescent *Quercus* (Oak), *Pseudotsuga* (Douglas fir), and a very few *Pinus* (Pine) species around the world.
- Epicormic resprouting isn't found in most fire prone environments and only has advantages under certain fire regimes.
- Epicormic resprouting tree species may be suitable for reforestation efforts in fire-prone ecosystems with moderate to high intensity fires that occur frequently.

The trait is most likely to have evolved in moderately productive, tree sprinkled savanna habitats with frequent, moderate-to high-intensity grass fires. The trait currently occurs in some frequent crown fire forests, as well as some savannas and open woodlands that undergo frequent surface fires (Fig.2).



Figure 1. Examples of postfire epicormic resprouting after a crown fire. Left: Canary Island Pine (*Pinus canariensis*) woodland few years after fire; Right: epicormic resprouts of Canary Island Pine (*P. canariensis*) 3 months postfire. Photos by J.G. Pausas.

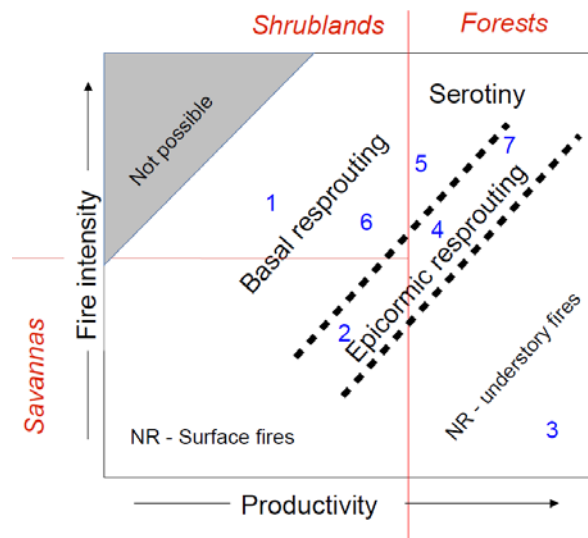


Figure 2. Schematic representation of the occurrence of postfire epicormic resprouting, basal resprouting and serotiny of the dominant woody species in relation to fire intensity and productivity. This refers to ecosystems with high natural ignitions (high fire frequency). In this space, serotiny and epicormic resprouting may overlap until you include fire frequency: serotiny fails when fire intervals are shorter than the maturity age. Note that low productive environments cannot support high fire intensity fires (grey area). Dotted red lines are rough limits between forests, shrublands and savannas, although in fact, they can overlap along the productivity gradient. NR means conditions were resprouting is of little relevance (weak or absence) for the dominant growth form; e.g. where plant height to flame high is low (Pausas 2017) like in forest with frequent understory fires protected by a thick basal bark (right) or in some savannas and grasslands (left). Numbers are the approximate location of some ecosystems; 1: Chaparral-type shrublands; 2: Brazilian savannas; 3: Ponderosa Pine (*Pinus ponderosa*), Longleaf Pine (*P. palustris*); 4: Pitch Pine (*Pinus rigida*), Pond Pine (*P. serotina*); 5: Aleppo Pine (*Pinus halepensis*); 6: mallee-type *Eucalyptus*; 7: Tall *Eucalyptus*, Canary Island Pine (*Pinus canariensis*).