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Publication Brief for Resource Managers

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Evolutionary Origins of Plant Adaptations Should Not Influence Fire Management Decisions

In response to a recent criticism of the practice of prescription burning published in *Trends in Plant Science*, USGS scientist Jon Keeley and colleagues from Spain, South Africa and Australia contend that when applied within the context of a landscape's natural fire regime, prescribed burning remains a viable treatment to manage native plant ecosystems.

Critics use plant trait origins as arguments against fire management practices. But as Keeley and colleagues point out, this argument offers flawed logic on how to maintain biodiversity in fire-prone ecosystems.

First, no plant species is "fire-adapted" but rather, a species can bear adaptive traits that help it survive a particular fire-regime — some plants may be adapted to frequent fires, others may be adapted to infrequent or zero fires. It is a plant's functional response to the particular fire regime of its landscape that dictates how a species will respond to fire management practices.

Second, natural selection processes that resulted in these functional traits may have taken place over hundreds of millions of years. Although it is possible that a fire-adaptive trait originally functioned as a response to some other landscape regime, this cannot be used as an argument against contemporary management practices. Natural selection theory suggests that a trait will be retained if it benefits the species under new pressures. So if a tree species' serotinous trait originally functioned as a response to a drought-prone landscape — yet still benefits that species after the landscape has shifted to a fire-prone landscape — serotiny in that species is now effectively an adaptive trait for a fire.

In any case, fossil evidence now shows that many plant lineages have had to adapt under the pressures of surface fire and crown fire regimes since the Paleozoic Era — before the time of dinosaurs.

Management Implications

- Management decisions with regard to fire effects on native landscapes should consider the native plant species' adaptive traits based on the contemporary functions of those traits — not their evolutionary origins.
- Each species possesses traits that now functionally adapts it to the particular fire regime of its contemporary landscape — and these species will be equally threatened if humans have altered that contemporary fire regime, and if those impacts are not managed and reversed with corrective treatments, including prescription burning.

THIS BRIEF REFERS TO:
Keeley, J.E., J.G. Pausas, P.W. Rundel, W.J. Bond, R.A. Bradstock. 2011. Fire as an Evolutionary Pressure Shaping Plant Traits. Trends in Plant Science 16(8): 1360-1385. doi: 10.1016/j.tplants.2011.04.002

THIS BRIEF AND PUBLICATION IS IN RESPONSE TO:
Bradshaw, S.D., K.W. Dixon, S.D. Hopper, H. Lambers, S.R. Turner. Little Evidence for Fire-Adapted Plant Traits in Mediterranean Climate Regions. Trends in Plant Science. doi: 10.1016/j.tplants.2010.10.007

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Modern giant sequoias (*Sequoiadendron giganteum*) exhibit fire-triggered serotiny. Forest managers must still manage sequoias for this functional response to fire, whether or not serotiny in ancestral sequoia species initially arose due to natural selection by fire (Image courtesy of National Park Service).