# Putting Out Fire With Gasoline: Pitfalls in the Silvicultural Treatment of Canopy Fuels[1]

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## Abstract

There is little question that forest stand structure is directly related to fire behavior, and that canopy fuel structure may be altered using silvicultural methods to successfully modify forest fire behavior and reduce susceptibility to crown fire initiation and spread. Silvicultural treatments can remediate hazardous stand structures that have developed as a result of the exclusion of low-intensity surface fires: abundant case studies offer evidence of crown fires subsiding upon encountering recently-thinned stands, and modeling studies corroborate. Yet treatments applied to abate one component of crown fire potential may inadvertently promote conditions that exacerbate fire behavior. Canopy fuel treatments typically target one or two parameters of fuel load and contiguity, but they directly or indirectly influence many more related components. In addition, canopy fuel treatments directly affect stand development patterns, and hence future fuel structures and fire behaviors. A review of stand processes associated with thinning suggests nine situations by which silvicultural treatment of canopy fuels can inadvertently exacerbate crown fire hazard or fire severity:

1) translocation of live aerial fuels to dead surface fuel complex
2) inflation of fuelbed depth associated with treatment residues
3) increase in fuel availability due to modified forest floor microclimate
4) enhancement of subcanopy wind penetration and turbulence
5) reduction of duff moisture content associated with reduced canopy shade
6) proliferation of stump sprouts in the lives surface fuel load
7) proliferation of seedling regeneration due to forest floor scarification
8) release of advance regeneration and development of midcanopy fuel layer
9) cessation of overstory crown recession and vertical integration of fuel complexes

Silvicultural manipulations to degraded fire-adapted forest ecosystems offer great promise for restoration, but prescriptions must be examined carefully for their dynamic effect on fuel structures over time. Rather than restoring historic fire regimes, today's fuels management interventions establish new fuel structures and put stands on new trajectories of structural development that have direct implications for future fuel structures and fire behavior. Understanding the many ways that stand structure relates to fire behavior and crown fire hazard helps avoid negative consequences. Understanding forest fuels dynamics, or changes in forest fuel structures over time, helps to forecast the persistence of canopy fuel treatment effectiveness and the extended influence of those treatments on future fire behaviors.

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