

Developing an integrated system for mechanical reduction of fuel loads at the wildland/urban interface in the southern United States

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Summary

Prescribed fire is used routinely in the southern United States to reduce fuel loading and decrease the risk of catastrophic wildfires, improve forest health, and manage threatened and endangered species. With rapid human population growth, southern forests have become fragmented by an extensive road network and intertwined with urban uses in a wildland-urban interface (WUI) pattern. It is practically impossible to use prescribed fire in the more urbanized portions of the interface. Nevertheless, fuel reduction treatments still are needed in fire-dominated “urban woodlands.” Alternatives to prescribed burning may involve mechanical reduction of current fuel loads and maintenance of low-risk understory through herbicides. Techniques are needed that can effectively reduce fuel loads through mechanical means, and are acceptable to homeowners. Additionally, utilization scenarios need to be identified for this class of raw material to make removal economically attractive to operators. An integrated system is being developed that will manage fuel loads in urban woodlands through mechanical means.

Keywords: *Vegetation management, engineering systems, landscape ecology, prescribed fire.*

Introduction

Prescribed fire is used routinely in the South to reduce fuel loads and decrease the risk of catastrophic wildfires; to improve forest health; and to manage threatened and endangered species. The ability to use prescribed fire is problematic in urbanizing areas of the South, the so-called wildland-urban interface (WUI). Nevertheless, fuels must be managed even in urban woodlands. Mechanical alternatives to prescribed fire have been proposed to reduce current fuel

loads that have built up during the last 50 years of aggressive fire suppression. Herbicides or continued mechanical methods will be needed to maintain understory species of low fire risk. Methods must be acceptable to homeowners, as well as cost-effective. This paper provides an early report of efforts to develop an integrated system of managing fuel loads in the WUI environment.

Characteristics of the Interface

Demographic changes in the South affect natural resources and the attitudes of southerners to traditional management practices such as prescribed fire (Cordell *et al.* 1998). The WUI, where homes or other structures are adjacent to, or intermixed with forests is a particularly vexing locale for natural resource managers (Macie and Hermansen 2002). More people are living at the interface and the transportation system is expanding, becoming denser and more pervasive. In most of the South, this is an area of fire-adapted natural vegetation. Critical challenges for managers include wildfire prevention, suppression, and mitigation. Increasingly, one of the most effective tools in the manager's kit, fuel reduction by frequent understory burning, is off-limits because of safety and liability risks (Achtmeier *et al.* 1998, Wade and Brenner 1995) or public dislike for inconvenience of smoke (Macie and Hermansen 2002).

The traditional idea of the wildland urban interface is an area of urban sprawl where new housing developments abut public or private wildland. A less obvious form is the isolated interface where scattered, remote structures are dispersed in wildland. Typically these are second home or summer recreation structures surrounded by forest vegetation. The wildland island is a park or forest stand within an urban area. Between these extremes is the intermix zone of areas undergoing a transition from natural resource uses such as forestry or agriculture to urban uses. These areas may have been bypassed by leapfrog urban development. Each type of WUI is dynamic; parcel size generally decreases, further fragmenting forest cover; road and population densities generally increase, accompanied by changing demographic profiles and cultural values (Cordell *et al.* 1998). The vegetation communities types, stand structures, fuel types and loads vary as well by physiographic province, from the coast to the mountains. There is no single parameter, or simple set of parameters, that adequately describe the WUI environment.

Fuel Reduction Methods

Forest operations appropriate for WUI conditions applications must be matched to terrain and stand conditions, the unique constraints of operating in the WUI, the product specifications of any extracted materials, and the prescription requirements of the treatment. Conventional mechanical reducedon equipment is designed to operate effectively on large areas so high speed and maximum cutting width are common design goals. Operations for the WUI, on the other hand, should be lightweight to minimize soil impacts and road transportation problems. Cutting width and speed may not be as important as minimizing thrown debris and operating in tight quarters near structures and the public.

Operations to extract material must be properly adapted for WUI applications. Conventional forest operations face significantly increasing costs as tract size drops below 10 ha (Greene and others 1997). This is primarily due to the increasing overhead of move-in costs and delay time associated with large capital-intensive equipment. In the WUI, operations that involve a single machine performing multiple functions will have lower move-in costs. Smaller equipment may also be advantageous if multiple machines can be moved on a single transport trailer.

The equipment configuration must also be tiered to the product and processing possibilities. Biomass material that has no product value should be treated (mulched) in the stand to minimize costs. Larger diameter material may have value as pulpwood, fuel chips, or even sawlogs. This material may be processed to appropriate dimensions, extracted from the forest and transported to mills. In dense, overstocked stands resulting from fire suppression, reducing fuel loads through biomass thinning may allow use of prescribed fire (Wade *et al.* 1998). In such cases, combining a small chipper with cut-to-length harvesting systems may be feasible (Bolding and Lanford 2001). A complete fuel reduction treatment in the WUI will thus require an integrated system of several machines to achieve stand management goals while minimizing costs and maximizing fibre recovery and utilization.

Markets

Viable markets and economical processing would provide outlets for small-diameter timber in our forests and in the WUI. Forests currently provide a multitude of wood products with many produced from small diameter timber (Hansen *et al.* 2001). Among these is dimension lumber and construction wood products that include engineered wood products. Also a variety of specialty products targeted at niche markets are currently produced. Expanding production of engineered wood products could utilize larger amounts of small-diameter timber and several under-utilised species. Resulting removals of small-diameter timber would contribute significantly to a reduction in fuel loads and a lessening of the potential for catastrophic fire. Available local markets will be the key to developing effective fuel reduction methods to bring fuel loads back to manageable levels.

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Profile

John Stanturf is Project Leader, Disturbance and Management of Southern Ecosystems unit of the USDA Forest Service, Athens, Georgia. The unit is the primary research group studying fire in the southern United States. Stanturf is a forest soil scientist (PhD Cornell University). His personal research focuses on ecosystem restoration. He is Working Party Chair of the IUFRO WP 1.17.02, Restoration of Boreal and Temperate Forests and Working Group Deputy, 1.17.00, Restoration of Degraded Sites. Stanturf is a member of the IUCN Commission on Ecosystem Management and member of the Silviculture Working Group of the North American Forestry Commission (FAO).

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