An Experimental Approach to the Evaluation of Prescribed Fire Behavior

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Abstract
Prescribed fire is a commonly used practice for managing wildland fire spread and intensity. However, due to limits in the current scientific understanding of wildland fire behavior in general, it is difficult to predict the effectiveness and efficiency of a particular regimen of prescribed fire-based fuel treatments in a given environment. As part of a larger project intended to aid in such an assessment, the first in a series of experimental prescribed fires was conducted. Efforts were made to both quantify various aspects of fire behavior and to obtain an accurate measure of pre- and post-fire fuel loadings. This paper focuses on an initial investigation of the fire behavior, as this is necessary for contextualizing the level of fuel treatment achieved. In particular, the range of observed surface fuel consumption and fireline intensities is discussed, the role of ambient wind conditions is considered, and a qualitative assessment of canopy fuel consumption is presented.

Keywords: Fire behavior, prescribed fire, fuel treatments, fire intensity

1. Introduction

Hazardous fuel reduction treatments are important for both the mitigation of wildland fire risk and the support of suppression efforts. In the United States, significant financial resources have been directed to this goal, with an average of $500 million spent by the Federal Government each year from 2002-2012 (Gorte 2011). However, rigorous experimental measurement and proper metrics to measure the success of fuel reduction measures are lacking. As stated by Omi and Martinson (2002), “the lack of empirical assessment of fuel treatment performance has become conspicuous”. While the aforementioned report found that fuel treatments were able to modify extreme fuel behavior, questions remain as to the intensity and repetition of treatment needed in a given ecosystem to maintain a desired condition. Further, the success of a certain treatment may not be consistent for different ecosystems or treatment techniques (Gorte 2011). More work is clearly needed to understand and evaluate the effectiveness of these types of treatments.

One technique used to accomplish the reduction of hazardous fuels is prescribed fire, and is the focus of this work. When attempting to develop efficient and effective fire-based fuel treatment strategies, a proper understanding of fire behavior is particularly important. Managers must be able to understand