



Effects of Landscape-Level Fuel Treatments on Burn Probability and Flame Length in the Klamath Mtns.

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INTRODUCTION

This research project will determine how multiple fuel treatment types, organized in varying spatial arrangements, and at increasing proportions of a mixed-conifer forest in the Klamath Mountains of northern California (~20,000 ha) variably affect potential fire behavior. In addition, impacts to carbon and air pollutant sequestration and emissions before, during, and after a wildfire will simultaneously be assessed as part of a larger research project.

The research presented here demonstrates the initial phases of the overall project. This phase utilizes 3 landscape-level fuel treatment scenarios and compares them to an untreated landscape in order to determine their impacts to burn probability and fire intensity.

STUDY AREA

The study area is located on the Eddy Gulch Late-Successional Reserve (LSR) Assessment Area on the Klamath National Forest in northwest California (Figure 1). Vegetation there consists largely of a multi-layered, multi-aged forest dominated by Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) in association with Pacific madrone (*Arbutus menziesii*), white fir (*Abies concolor*), and others (Figure 2). The study area is proposed to undergo an ambitious fuel treatment project so as to protect adjacent communities and reduce the threat of stand-replacing wildfires.

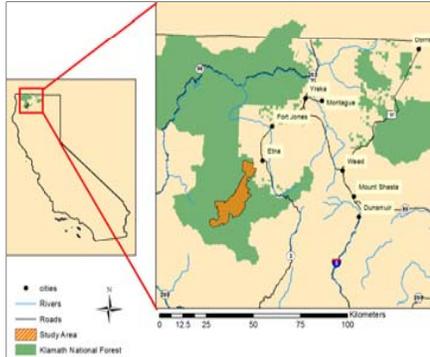


Figure 1. Location of the Eddy Gulch LSR.



Figure 2. Typical landscape of the Eddy Gulch LSR.

METHODS

Three fuel treatment scenarios were modeled using the ArcFuels workstation within ESRI ArcMap software (Figure 3). Scenario-1 (Mechanical + Burn) included both mechanical thinning on ridge tops and broadcast burns on adjacent slopes. Scenario-2 (Mechanical-Only) included only ridgetop thinning. Scenario-3 (Burn-Only) included only broadcast burns on the slopes.

The modeled fuel treatment scenarios were used to build separate FlamMap landscape files, which were then used in FlamMap to model flame length (meters) and burn probabilities for each fuel treatment scenario. An untreated landscape was also used in FlamMap for comparison to the treatment scenarios.

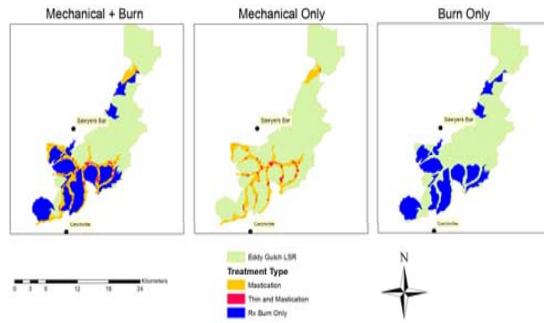


Figure 3. Proposed treatment scenarios on the Eddy Gulch LSR.

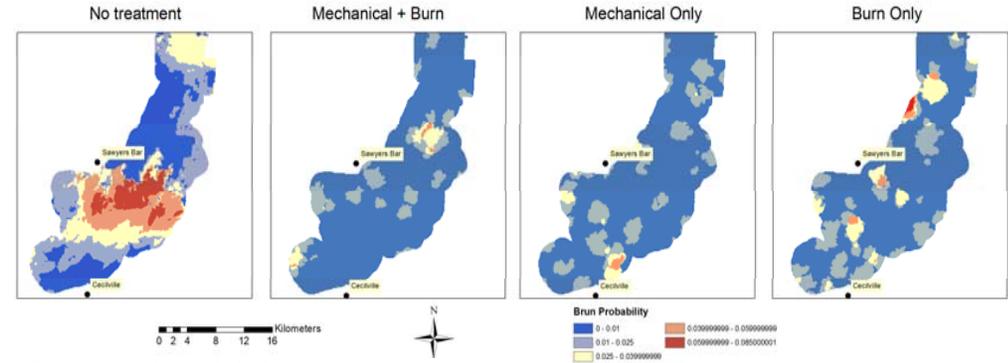


Figure 4. Burn probabilities for fuel treatment scenarios on the Eddy Gulch LSR.

RESULTS

Preliminary results point to significant reductions in burn probabilities and flame lengths across the study area for each treatment scenario compared to the untreated landscape (Figures 4-5). Replication and statistical analysis will be conducted in order to determine if there are significant differences in burn probabilities or flame lengths between the treatment scenarios. In addition to the 3 treatment scenarios addressed here, future work will incorporate larger proportions of the landscape to determine if the size of the proposed treatment units achieves the most efficient reduction in fire behavior.

Following full completion of fire behavior analysis, we will then determine how fuel treatment scenarios simultaneously impact ecosystem services provided by the forest. Specifically, we will examine landscape-level carbon sequestration and air pollution removal capacity before and after an unplanned wildfire event, as well as carbon and smoke emissions associated with such an unplanned fire event. We hope that this methodology will aid land managers in better assessing the potential tradeoffs of proposed landscape-level fuel management strategies.

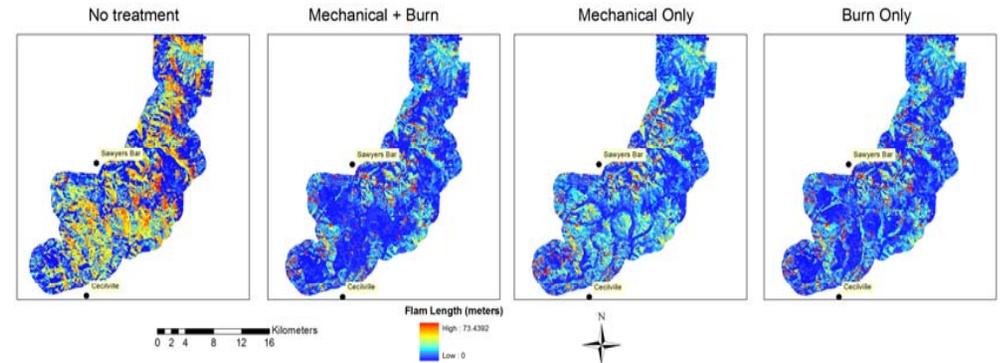


Figure 5. Simulated flame length (m) for various fuel treatment scenarios on the Eddy Gulch LSR.

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