



# Ecological Restoration Institute

Fact Sheet: Fuels Reduction Treatments and Mega-fires

August 2012



## Impacts of fire hazard assessment and fuel reduction priorities on mega-fire\* outcomes: *A hypothetical test using the Wallow Fire in Arizona*

### BACKGROUND

In response to Congress, the Office of Management and Budget (OMB) and the Government Accountability Office (GAO), United States Forest Service (USFS) has developed a process for prioritizing and allocating funding for fuel reduction treatments<sup>1</sup>. The national level process assesses fire hazard (using fire simulation modeling) and combines it with other factors to inform national level budget allocations for hazardous fuels programs to the USFS Regions (Calkin et al. 2010, Finney et al. 2011, FPA 2011). Allocation processes at regional and federal forest levels incorporate additional local values at risk, both social and economic, and prioritization assessments. These processes are not standardized among regions in order to allow for the inherent variability at finer scales.

In 2011 the Wallow Fire burned over 538,000 acres on the Apache-Sitgreaves (ASNF) and Gila National Forests, Tribal and private lands in Arizona and New Mexico. The fire burned through coniferous forest, including pinyon and juniper woodlands, ponderosa pine and higher elevation mixed conifer forests. More than 30% of the fire burned at high severities (RAVG 2010), which is uncharacteristic when compared to historic patterns of fire severity (TNC 2007). Initial reports suggest communities within the Wallow Fire perimeter were largely protected by adjacent fuels reduction treatments. Research is on-going to quantify the treatment effectiveness.

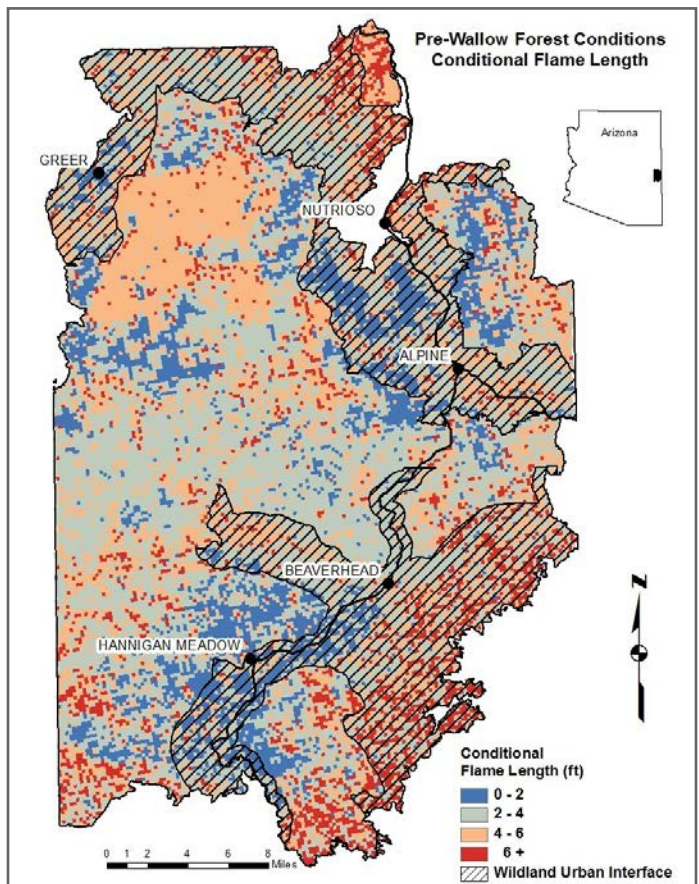
In response to the 2011 Wallow Fire in Arizona the Ecological Restoration Institute (ERI) was asked to analyze the effectiveness of the national prioritization process for altering mega-fire outcomes.

### MANAGEMENT QUESTION

If nationally developed USFS fuel reduction priorities had been implemented in the ASNF prior to the Wallow fire, would wildfire outcomes under large-fire (Wallow-like) conditions have different fire severity and probability patterns when compared to no implementation (2010 conditions)?

(\***Mega-fire** = uncharacteristically large and severe wildfire)

<sup>1</sup>The Department of the Interior, Office of Wildland Fire also has a separate prioritization process not included in this analysis.

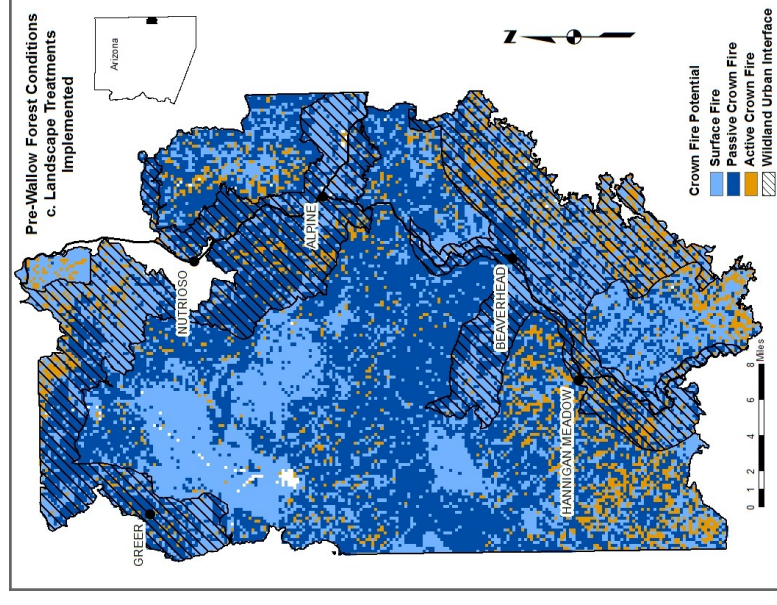
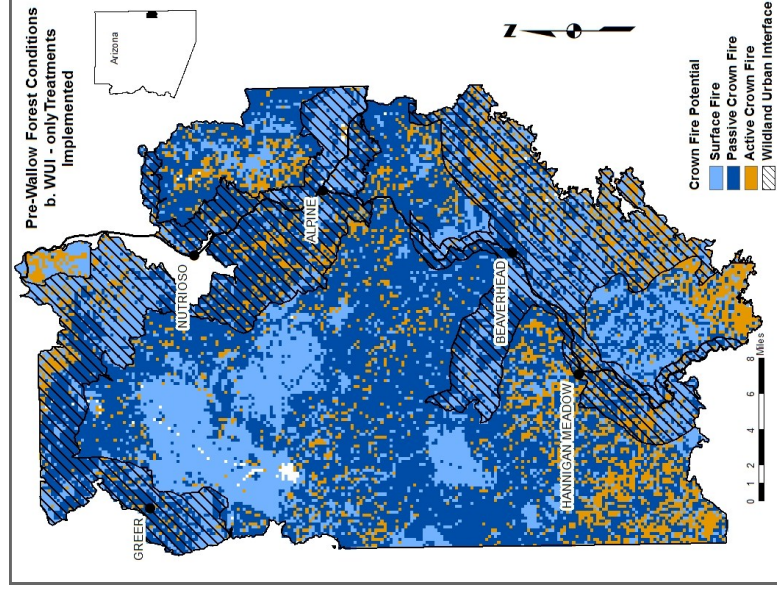
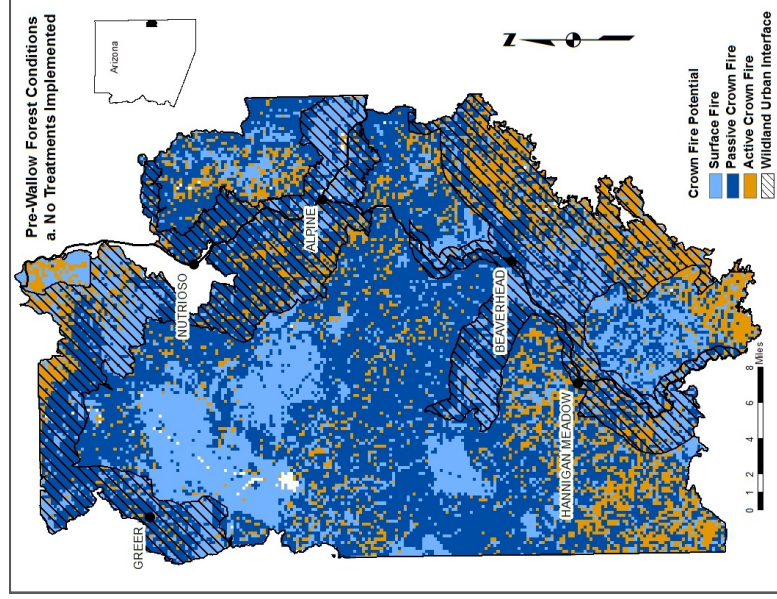


**Fig. 1.** Conditional Flame Length from fire modeling results. Red pixels denote high average probability of larger than 6-foot flame lengths (FPA 2011, Ager et al. 2010, Thompson et al. 2011) and were selected for hypothetical treatment implementation. Treatments were implemented by changing the fuel and tree canopy data layers in the input data files for the FlamMap fire modeling software (Finney et al. 2007).

The Ecological Restoration Institute is dedicated to the restoration of fire-adapted forests and woodlands. ERI provides services that support the social and economic vitality of communities that depend on forests and the natural resources and ecosystem services they provide. Our efforts focus on science-based research of ecological and socio-economic issues related to restoration as well as support for on-the-ground treatments, outreach and education.

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## METHODS

This analysis focused on the effectiveness of the national prioritization process for locating fuel reduction treatments to alter mega-fire severity outcomes. The purpose of this assessment is to examine the two spatial input layers to the national prioritization process, fire hazard outputs combined with communities-at-risk, as the sole metric for fuels reduction priorities. This work was done within the Wallow Fire perimeter on the ASNF in Region 3. In order to evaluate the effectiveness of treatments for altering wildfire outcomes the ERI compared simulation modeling of a mega fire within the Wallow fire perimeter a) in the 2010 landscape with no treatment; b) after implementation of treatments designed to protect communities-at-risk (WUI-only treatments); and c) after implementation of treatments designed to lower fire risk across the landscape. Communities-at-risk and areas of high fire hazard are a national priority for protection and dominate fuel reduction treatment investments. The fire hazard assessment data layers for this analysis were obtained from Fire Program Analysis project staff. The Wildland Urban Interface (WUI) boundaries used by ASNF to define communities-at-risk were obtained from Forest Service staff.

## RESULTS

National priorities as assessed in this analysis are represented by high fire hazard within WUI areas. Maps reflect crown fire potential, the proportion of the landscape that would support an Active Crown Fire – the ability to support a fire moving from crown to crown; a Passive Crown Fire – the ability to torch but not move crown to crown or a Surface Fire – a fire supported by ground fuels including grasses, flowers and tree litter. Crowning fires in forested landscapes can be more costly to suppress and control depending on the values at risk from the fire. Crown potential is shown for three scenarios: a. pre-Wallow Fire conditions; b. pre-Wallow Fire conditions with treatments implemented in high fire risk pixels only in designated WUI (red pixels from Fig. 1 within WUI); and c. pre-Wallow Fire conditions with treatments implemented in high fire risk pixels across the landscape (all red pixels from Fig. 1). Treatments in the WUI reduced active crown fire potential across the entire landscape by 12% and flame lengths by 6%. Treatments on all priority areas reduced active crown potential across the entire landscape by 40% and flame lengths by 30%.

## MANAGEMENT IMPLICATIONS

1. Fuel reduction treatments are effective at reducing fire behavior where implemented and can successfully reduce risk to prioritized values like communities (model results and on-going field research).
2. Fuel reduction treatments that occur at broader scales would have bigger impacts on overall reduction of crown fire.
3. WUI-only treatments result in areas of unchanged crowning potential across the pre-treatment landscape. Continuous fuels in uncharacteristically high loadings continue to support high fire intensities and severities at landscape scales with losses to ecological integrity in forests adapted to more frequent fire conditions.
4. National metrics and assessments, such as fire hazard assessments and residential density, benefit from flexibility in finer-scale interpretation. There is no standardized method to scale down to national forests or Forest Service regions because of the inherent variability across the nation in biophysical (vegetation and fuel types) conditions as well as socio-economic conditions. Published research in this area continues to show effective incorporation of more local values-at-risk at both forest and regional scales with nationally assessed risks (Calkin et al. 2010, Ager et al. 2010, Thompson et al. 2011 and references therein).

## ONGOING WORK AND LEVERAGE OPPORTUNITIES

1. Region 3 fire staff have asked ERI to help create a demonstration of a mid-scale, region-wide values assessment and risk prioritization system. Local values and updated assessments will be overlaid with national fire risk assessments to inform current planning processes.
2. ERI is working with the LANDFIRE team on an analysis of restoration opportunities. Forest systems (Fire Regime I) and stand conditions (closed canopy, mid-successional stage) that are in higher proportion today than found historically will be identified. These systems would benefit from restoration treatments to restore ecosystem resiliency and integrity. Restoration treatments in these systems can also reduce the potential of high severity wildfires. Such treatments will be modeled to assess change in fire behavior metrics across the landscape.

## AUTHOR'S NOTE

Pixelated fire behavior runs are difficult to translate to treatment units. Planning units on federal lands include areas with high, moderate and low predicted fire severity. Treatments that impact only areas of "high fire hazard" pixels across a landscape, as done in this assessment, are unrealistic on the ground and make these results conservative. Implemented treatments polygons have more contiguous impact on fire behavior, which can further reduce risks of crowning potential (i.e. passive crown potential) and improve suppression opportunities (Ager et al. 2010).

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