



Is mastication + prescribed fire an effective control technique for multi-acre medusahead (*Elymus caput-medusae*) infestations?



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INTRODUCTION & OBJECTIVES

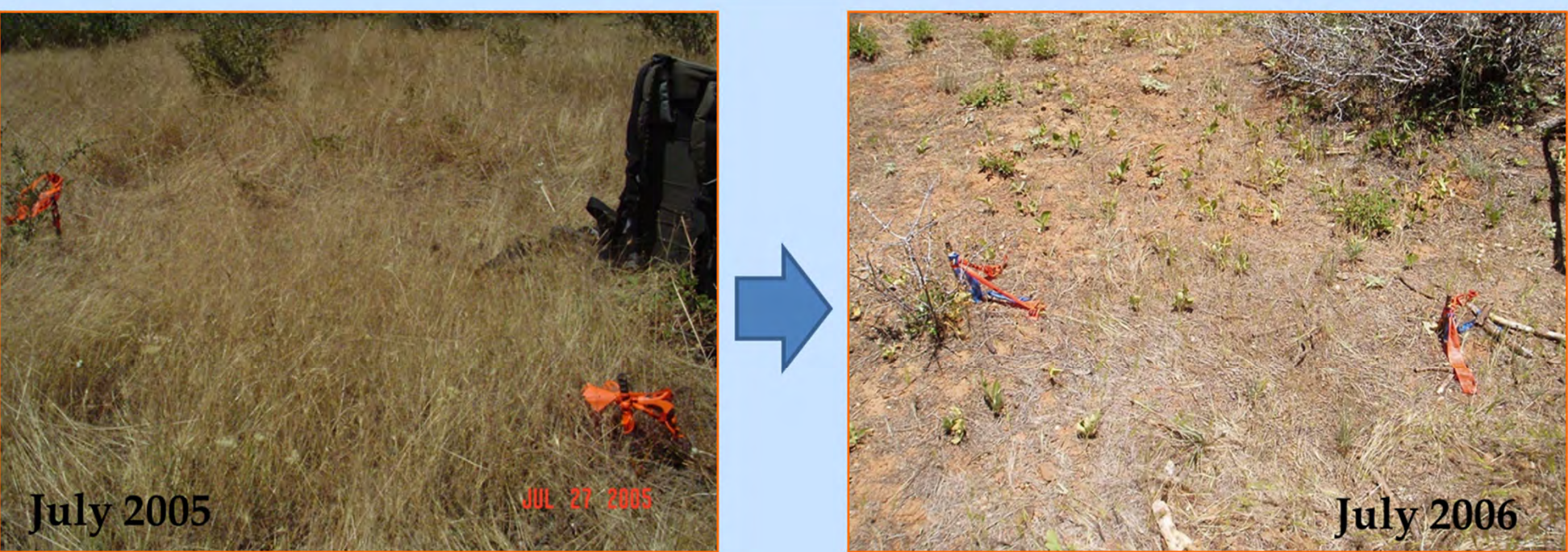
Over the past 20 years, managers of public lands in the western United States have witnessed an explosive spread of the highly invasive annual grass medusahead (*Elymus caput-medusae*). Most traditional control methods (e.g. manual, chemical, biological control) are either impractical or ineffective, leaving land managers few large-scale control options.



Studies that have investigated the use of prescribed fire to control medusahead have produced variable results. A number of studies have demonstrated that burning medusahead in late spring, prior to seed dispersal can significantly reduce infestations (Rice 2005). In contrast, prescribed burns initiated in the summer and fall, have not been effective because seeds are not damaged (Kan and Pollak 2000).

Over the past six years, Plumas National Forest (PNF) botanists have been testing flaming with a propane torch as a medusahead control method on a small scale. Results from these trials have demonstrated that spring flaming of small infestations (<5 ac) can reduce the percent cover of medusahead by an average of 95 percent (Coppoletta 2006). However, flaming is not feasible for large medusahead infestations because it is extremely time intensive during a short burn window. Nonetheless, these results suggest that high intensity fire—such as achieved with flaming—applied prior to seed set is an effective method of medusahead control.

Flaming treatments reduce medusahead cover (from Coppoletta 2006)



Mastication is commonly used to mechanically treat small diameter trees and shrubs for fuel reduction. This treatment utilizes machinery to break up or “chew” live and standing biomass and convert them into surface fuels. Mastication increases surface fuel loads which has been positively correlated to fire intensity in many plant communities. Because underburns are commonly scheduled for spring, they often, but not always, overlap with medusahead green-up.

From these results, we formulated the following experiment questions:

1. Can a frequently utilized fuels management prescription—mastication + underburn—also be utilized for control of large (>5 ac) medusahead infestations?
2. Does medusahead cover change in response to mastication + underburn?
3. If so, is cover change associated with shrub and tree cover? High fuel load?

We hypothesized that PNF’s mastication + underburn prescription conducted in the spring prior to medusahead seed set would increase fuel loads enough to produce high fire intensity that could act as effective control method. We also hypothesized that the abundance of medusahead would decrease in response to treatment.

METHODOLGY

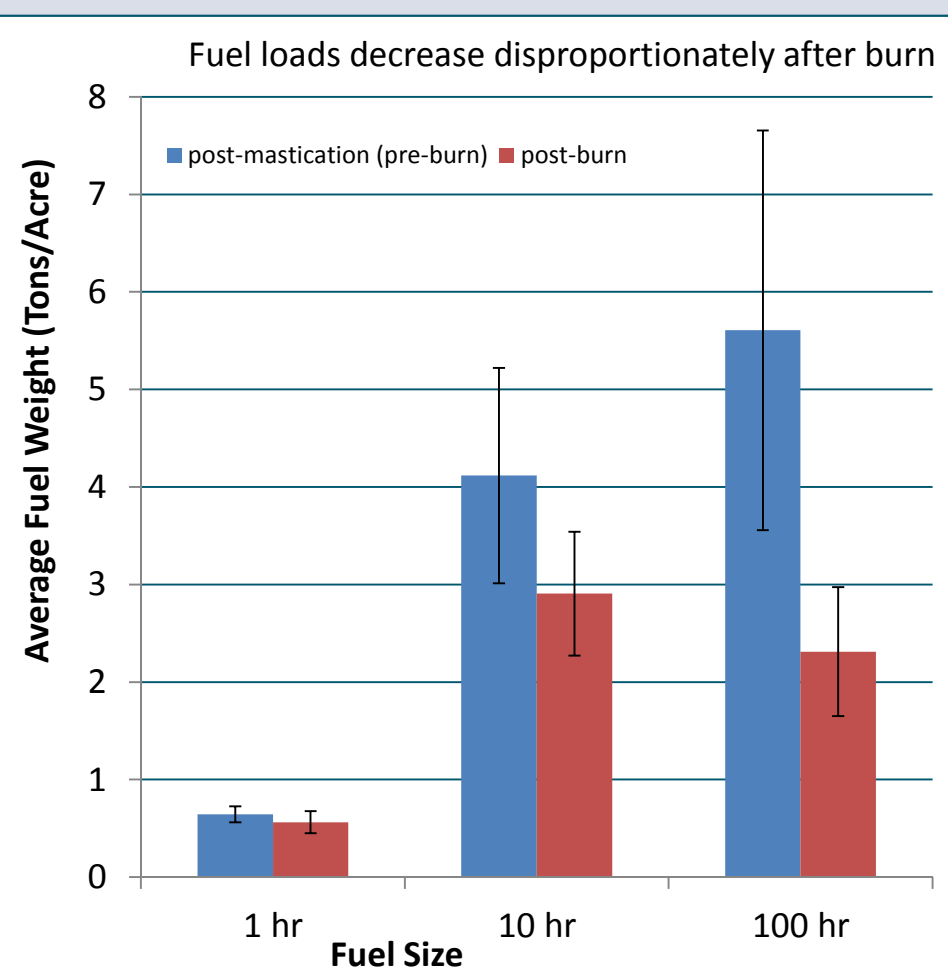
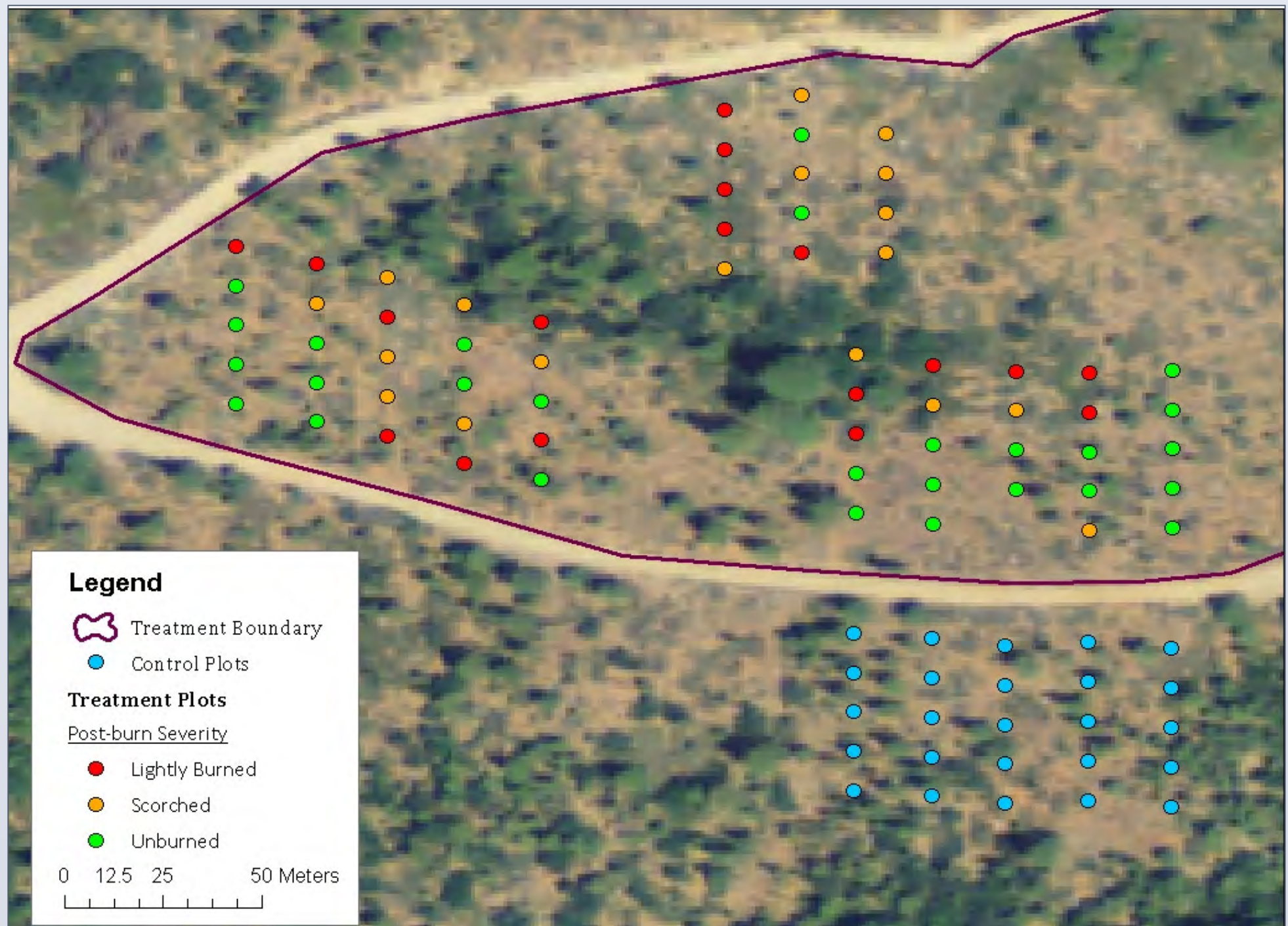
Mastication + spring underburn treatments that were part of a larger USFS fuels reduction project were used to examine control efficacy on a 20-ac medusahead infestation.

Eighteen permanent monitoring transects were established in June 2010—thirteen within proposed treatment area and five adjacent control transects. The treatment area was masticated in November 2011 and burned in April 2012. The following data were collected along each transect before and after treatment:

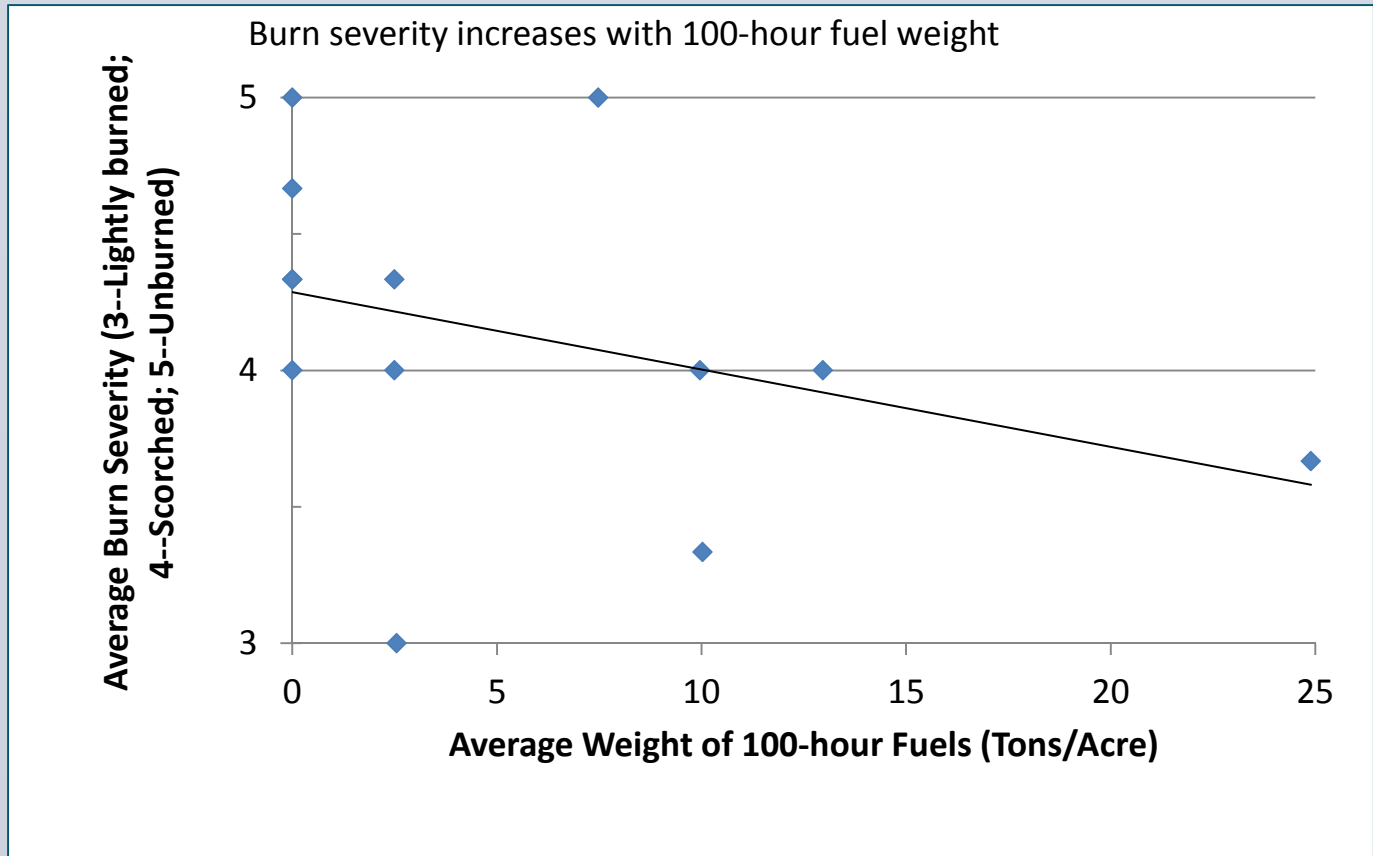
- **Cover:** Percent cover of medusahead, shrubs, and trees was estimated (using cover classes) within five 1m² quadrats placed along each transect.
- **Fuels:** Surface fuel measurements were collected after mastication treatments using the planar intercept (Brown’s transect) method along each transect.
- **Burn Severity:** Severity was assessed within the five 1m² cover plots using a National Park Service post-fire monitoring protocol (USDI NPS 2003)

One-way analysis of variance (ANOVA) was used to (a) compare changes in medusahead cover and shrub cover within the treatment unit and the control and (b) investigate the relationship between medusahead cover and burn severity. Simple linear regression was used to evaluate (a) the relationship between medusahead cover and overstory shrubs and (b) burn severity and fuel loads. Surface and ground fuel loads were calculated using equations developed for California forests (van Wagtenonk, et al. 1996). Descriptive statistics of surface and ground fuels by size class were calculated and used to compare with published fuel load estimates from other masticated areas within California (i.e. Kane et al. 2004).

RESULTS—FUEL LOADING & BURN SEVERITY

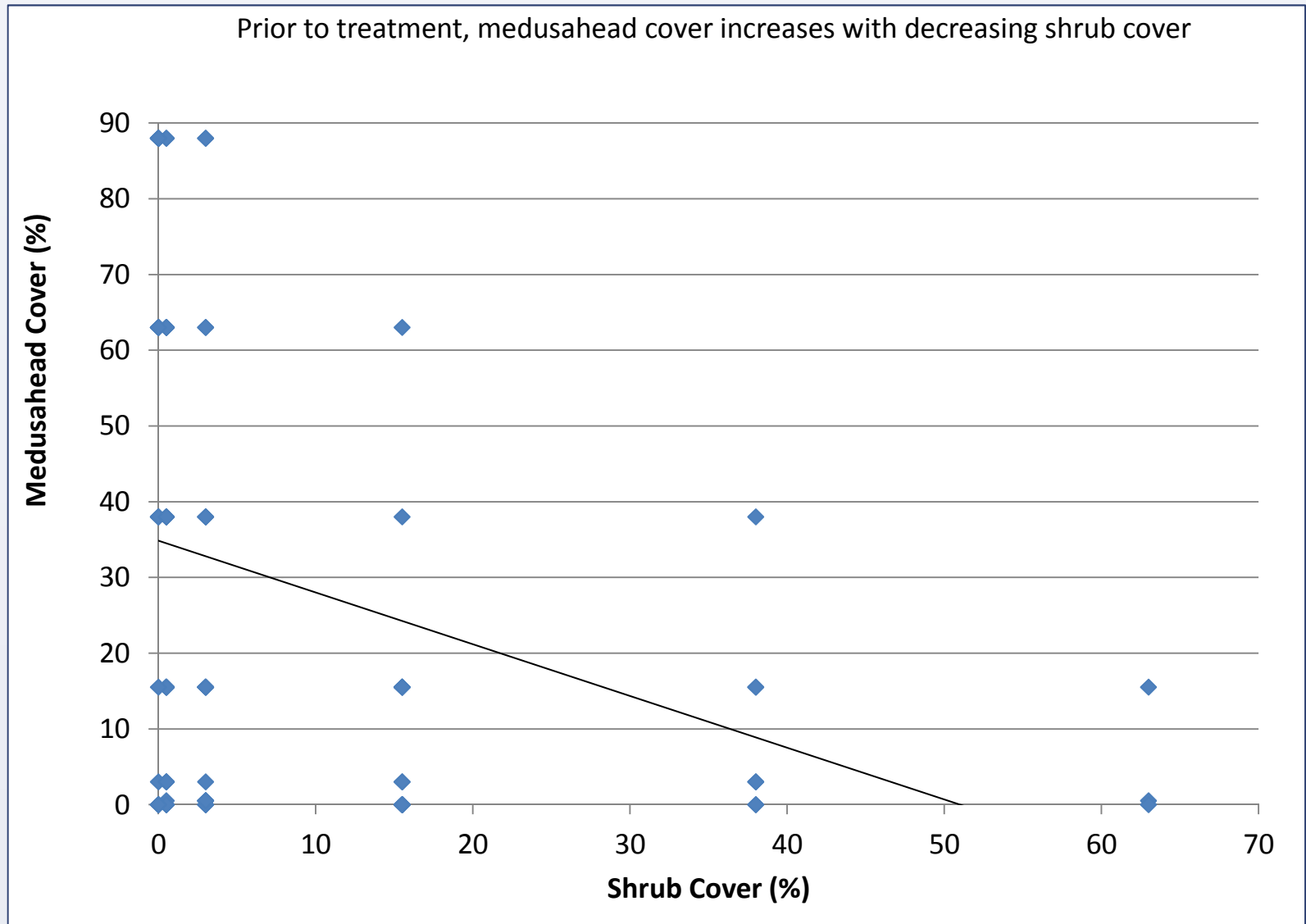


- Fire severity was much lower than expected
- Plots exhibiting no or low burn severity—71%
- Every transect contained some unburned patches
- Larger fuels were disproportionately reduced after burn
- Burn severity increased with 100-hour fuel weights
- 100-hour fuel loading may disproportionately impact severity

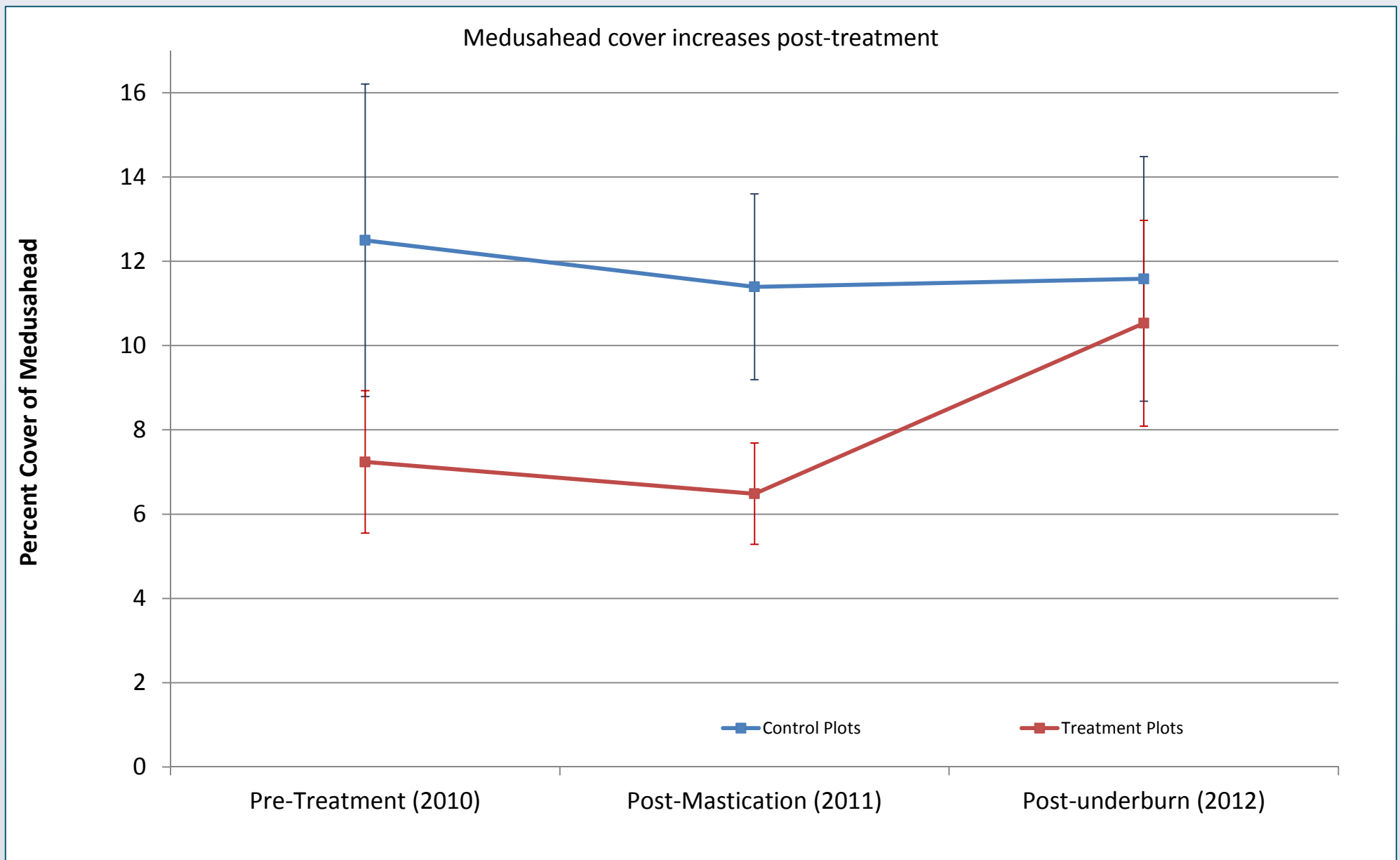


RESULTS—MEDUSAHEAD COVER

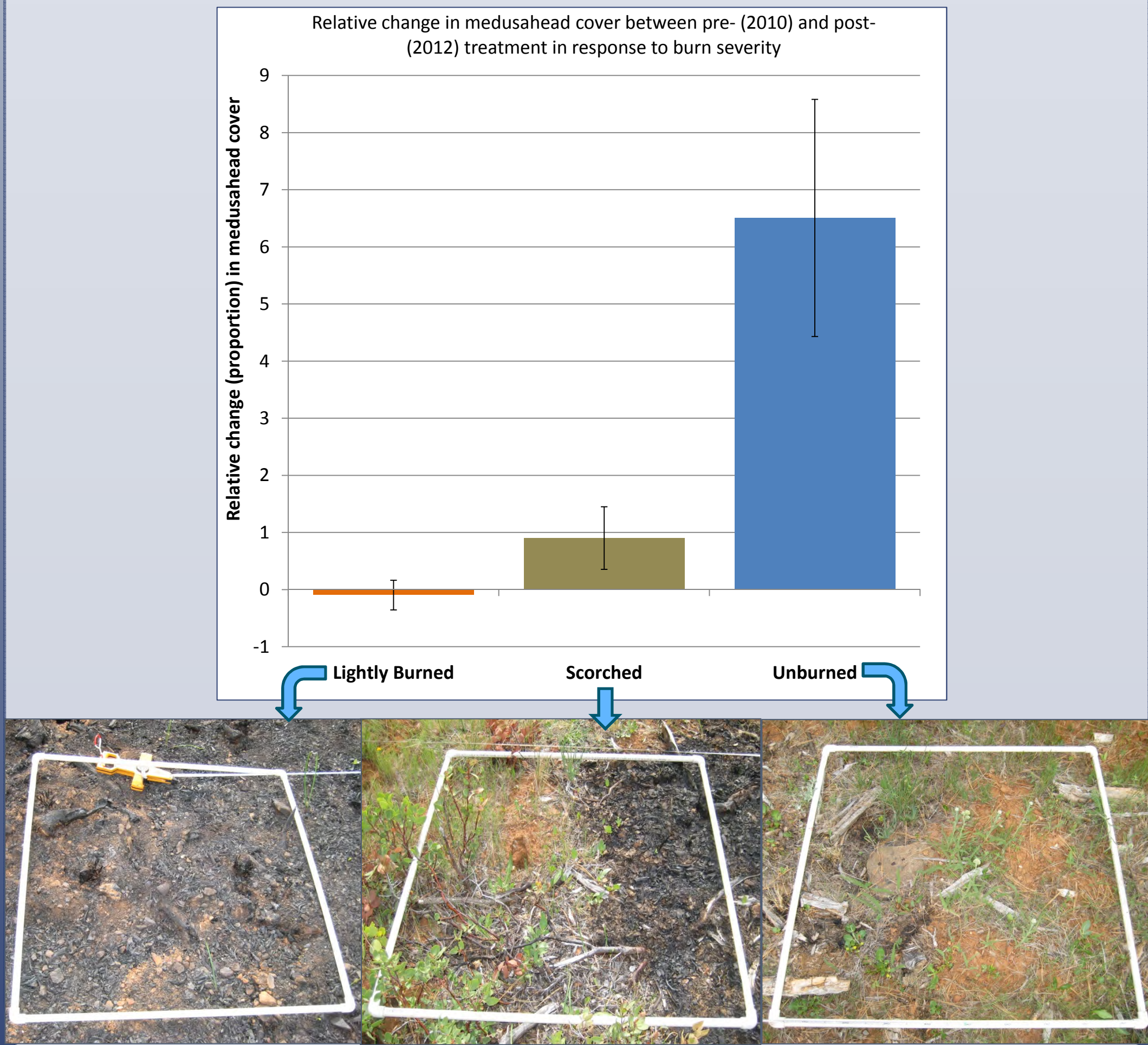
- Prior to treatment, plots with high shrub cover had significantly less medusahead cover ($p=0.0002$, $\alpha=0.05$).



- Percent cover of medusahead in treated area
 - Post-mastication—No significant change
 - Post-burn—Significant **increase**
 - High surface fuel loads within the treatment unit may initially suppress medusahead germination or inhibit dispersal to areas of newly created suitable habitat.



- Post-burn, there was a significant **increase** in the relative percentage of medusahead in unburned and scorched plots
- Note: Unburned plots were not control plots; they occurred within the treated area.



CONCLUSIONS

Is mastication (to increase fuels) + underburn an effective control technique for multi-acre medusahead infestations?

In montane chaparral habitats with medusahead, mastication + underburn (low severity) is not an effective medusahead control method and may even increase medusahead cover.

- Post-treatment cover of medusahead increased in treated areas
 - Highly undesirable
 - Consider excluding medusahead infestations from prescribed burns
- Narrow burn prescriptions restrict the potential for high burn severity
 - Early spring burn window occurs during high relative humidity, low temperatures, and high plant moisture levels.
 - Under these conditions, the heat / burn severity required for plant desiccation / consumption may be difficult to achieve.
- Variable fuel loads in montane chaparral result in patches of unburned fuels, including medusahead
 - Lack of continuous fuel bed reduces burn severity
 - Unburned medusahead patches are potential seed sources to colonize burned areas in future
 - Mastication + underburn may prove more effective in continuous fuel beds

Potential treatment modifications that warrant exploration:

- Increase fuel load—particularly larger fuels—in medusahead patches
 - Larger fuels (>100 hour) may play a more important role in increasing burn severity to a level sufficient for medusahead control
- Alter underburn timing
 - Burning later in the spring—closer to seed set—may increase burn severity & improve control
- Replicate in other fuel bed types, especially continuous fuel beds; may increase burn severity

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