

Introduction

On June 8th, 2006, a lightning strike ignited the Warm Fire on the northeastern edge of the Kaibab Plateau. The fire burned 24,000 ha in mixed conifer, ponderosa and pinyon/juniper plant communities and was managed as both a Wildland Fire Use (WFU) fire and wildland fire. In July 2006, a Burned Area Emergency Response team assessed the situation and implemented a seeding project in the high severity, wildland section of the burn. They reseeded with a non-native, annual grass; *Lolium multiflorum* that was chosen as it provides quick ground cover, is thought to prevent the spread of exotics, and is believed to exit the system within 2-3 years. This portion of our study focuses on ponderosa pine communities in high severity burned areas that were seeded versus those left to regenerate naturally.

Objectives:

- 1) Determine the effects of seeding with *Lolium multiflorum* on plant community composition
- 2) Analyze the impacts of non-native seed on tree seedling regeneration
- 3) Analyze the effectiveness of seeding on decreasing exotic plant cover

Methods cont.

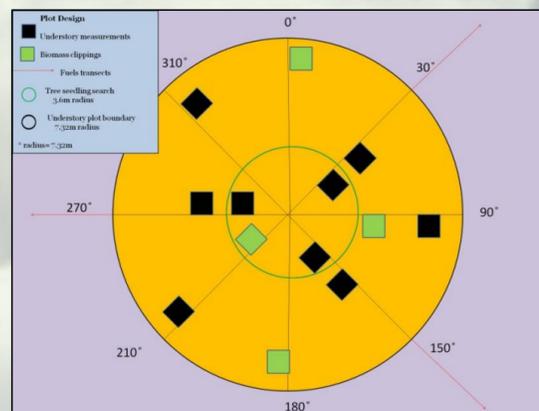
Measurements

Ocular estimations on nine 1x1m quadrats :

- % plant canopy cover per species
- % cover of grasses, forbs and total vegetation
- average height of each species
- % cover of ground substrates

Additional data:

- Species diversity (plot level)
- Tree seedling count (subplot)
- Canopy cover
- Overstory plot (12.6m radius)



Statistical Analysis:

PC-ORD to conduct a PERMANOVA and Indicator Species Analysis (which species drive the observed differences); JMP for an ANOVA on exotic and native cover

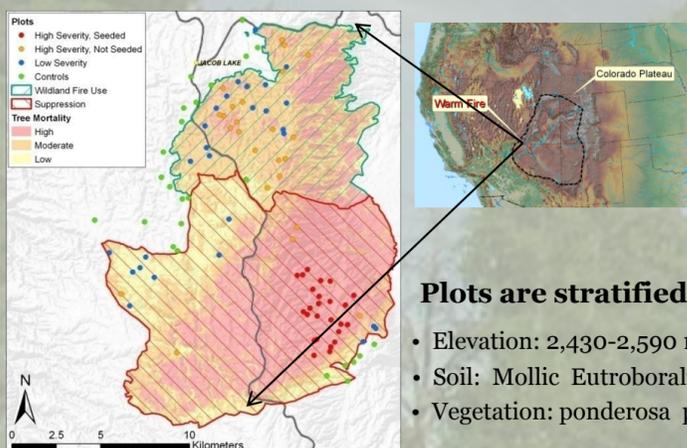
Discussion/Conclusions

- *L. multiflorum* appears to be a driving force affecting the plant community composition. (Fig.1)
- Two year post-fire findings suggest that the the reseeding effort was not as effective as anticipated at preventing the spread of exotics and the expected exit of *L. multiflorum* from the system has yet to be observed.
- The Indicator Species Analysis further supports previous findings that *L. multiflorum* may actually outcompete the tree seedlings and inhibit seedling recruitment. ^{1,2}

Our initial results indicate that following a high severity fire, reseeding may not be effective or the best restoration method to employ . These results have management implications for forest managers working to find the best methods to keep exotic plants from colonizing the Plateau. A healthy ponderosa pine forests is key to meeting the demands of timber harvest and the inhibition of seedling recruitment can be detrimental to that process.

Methods

Study Area



Plots are stratified by:

- Elevation: 2,430-2,590 m
- Soil: Mollic Eutroboralfs
- Vegetation: ponderosa pine

Treatments:

100 plots total (n=50 for this study)

- High severity- 25 seeded
- High severity- 25 not seeded
- Low severity and unburned/controls 25 of each

Results

- Significant difference in plant community composition (p=.016) between the seeded and non-seeded areas
- No significant difference between exotic (p=.1743) and native (p=.4425) cover between seeded vs. not seeded
- Two dominant tree species, ponderosa pine and aspen reported as strong indicators for non seeded areas.

Table 1.

Indicator species analysis results for significant indicators only	
Seeded	Non-seeded
<i>Lolium multiflorum</i> - Italian Ryegrass	<i>Pinus ponderosa</i> - Ponderosa pine
<i>Astragalus subcinereus</i> - Silver's milkvetch	<i>Populus tremuloides</i> - Aspen
<i>Linum puberulum</i> - Plain's flax	* <i>Verbascum thalapsum</i> - Woolly mullein
<i>Lotus wrightii</i> - Wright's deervetch	<i>Pseudognaphalium stramineu</i> - Cotton cudweed
	<i>Antennaria parvifolia</i> - Small leaf pussytoes
	<i>Androsace septentrionalis</i> - Rock jasmine
* exotic	<i>Muhlenbergia montana</i> - Mountain Muhly

References

- ¹ Barclay, A. D., J. L. Betancourt, and C. D. Allen. 2004. Effects of seeding ryegrass (*Lolium multiflorum*) on vegetation recovery following fire in a ponderosa pine (*Pinus ponderosa*) forest. *International Journal of Wildland Fire* 13:183-1
- ² Kruse, R. B., E. Bend, and P. Bierzychudek. 2004. Native plant regeneration and introduction of non-natives following post-fire rehabilitation with straw mulch and barley seeding. *Forest Ecology and Management* 196:299-310.

Figure 1. a and b



Seeded High Severity



Non-seeded High Severity

The image on the left shows *L. multiflorum* with Lupine and the image on the right shows a wide variety of plants listed in Table 1.

Plant community composition

Native colonizers:



Lolium multiflorum
Italian Ryegrass



Future Research/Analyses

- 2 more seasons of data collection/analysis
- Additional multivariate analysis to identify covariate influences, particularly soil, rock, slope and aspect
- Foliar cover, diversity and richness analysis of native and exotics

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