

# Using fire to restore pine/hardwood ecosystems severely impacted by southern pine beetle: first year results

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Study design: Before-after-control-impact experimental design (BACI)

Pre- and post-treatment measurements:

- Fire characteristics
- Fuel load and consumption
- Vegetation
  - overstory, understory, and herbaceous
  - planted pine seedlings (height and diameter)
  - seeded bluestem grass (percent cover)
- Soil and soil solution chemistry (C, N, and cations)
- Forest floor (mass, C, and N)

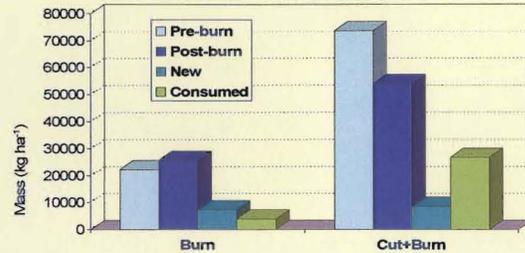


Fig. 3. Down fuel load ( $\geq 7.5$  cm diameter) and consumption.

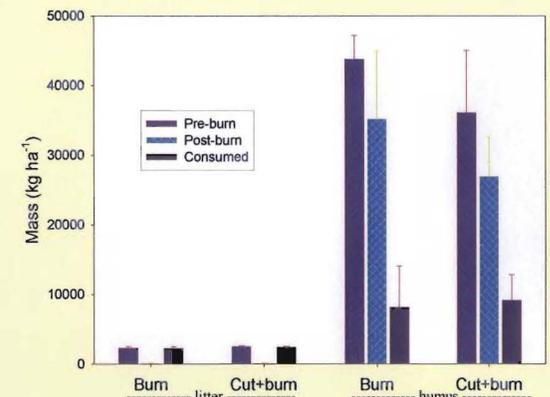


Fig. 4. Forest floor litter (Oi) and humus (Oe+Oa) mass pre- and post-burn.

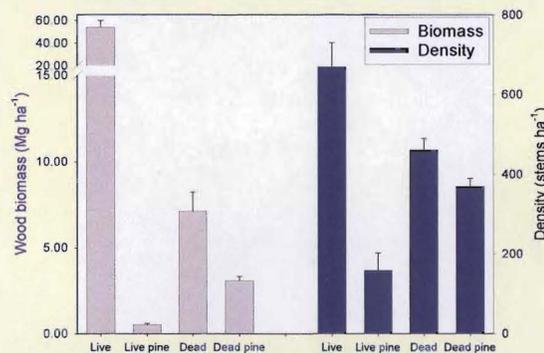


Figure 1. Pre-treatment (2005) aboveground biomass of live and dead trees (branch + bole). Biomass was estimated from species specific allometric equations.

Table 1. Overstory mean density and basal area before and the first growing season after treatments.

Treatment	Density (stems ha <sup>-1</sup> )		Basal area (m <sup>2</sup> ha <sup>-1</sup> )	
	Pre	Post	Pre	Post
Burn	466 (61)	169 (56)	11.14 (1.67)	6.26 (2.26)
Cut + burn	883 (58)	233 (64)	13.72 (1.61)	4.86 (1.40)
Reference	847 (107)	838 (107)	13.74 (1.51)	14.44 (1.52)

Standard errors are in parentheses.

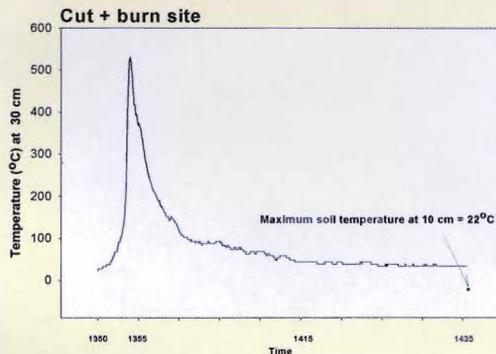


Fig. 2. High intensity, short duration fire.

Table 2. Understory woody species richness (number of species per plot) and density (stems ha<sup>-1</sup>).

Treatment	Richness		Density	
	Pre	Post	Pre	Post
Burn	6.4 (0.9)	6.5 (0.7)	16,500 (3466)	32,250 a (5870)
Cut + burn	8.6 (1.0)	7.4 (0.7)	27,375 (4160)	33,875 ab (4480)
Reference	7.6 (0.9)	8.5 (0.7)	12,450 (2330)	14,550 b (2757)

Woody stems < 5.0 cm dbh, >0.5 m height. Standard errors are in parentheses.

## Summary

- Before the prescribed fires, all sites had a large amount of dead wood (Fig. 1) due to tree mortality from the southern pine beetle.
- The prescribed fires were high intensity, short duration (Fig. 2).
- In the burn only treatment, the fire burned standing dead trees, which contributed large wood mass to the forest floor. More new wood was added to down material than consumed (Fig. 3).
- The cut+burn treatment reduced down wood mass (Fig. 3).
- On these high intensity burns, even though the forest floor litter layer was consumed, much of the humus layer remained intact (Fig. 4).
- Overstory density and basal area were reduced on the Burn and C+B treatments (Table 1), with no significant difference between these two treatments.
- Understory wood density was high before the treatments due to increased number of sapling following the pine mortality. Density increased again after treatments (Table 2).
- We are continuing sampling and analyses on this project to evaluate changes in vegetation composition and diversity, carbon and nitrogen pools, soil and soil water chemistry, and success of planted pine and bluestem grasses.