



# Combining Mechanical Fuel Reduction and Prescribed Fire at Devils Tower National Monument and Mount Rushmore National Memorial

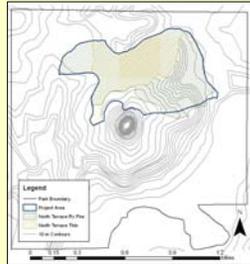
Cody L. Wienk, Dan L. Morford, and Andy D. Thorstenson



## Introduction

Changes in stand structure and fuel load have complicated the safe application of prescribed fire to ponderosa pine (*Pinus ponderosa*) forests in national park units across the western United States. Mechanical fuel reduction has become a necessary first step to reduce ladder fuels and tree density. A restoration project has recently been completed at Devils Tower National Monument and one is nearly complete at Mount Rushmore National Memorial. Tree removal with chainsaw, hand piling of material, and pile burning was utilized on both projects. Standard NPS Fire Monitoring Handbook (FMH) protocols were used at Devils Tower while a simplified monitoring design was implemented at Mount Rushmore to assess changes in stand structure and fuel loading.

## Location of Park Units

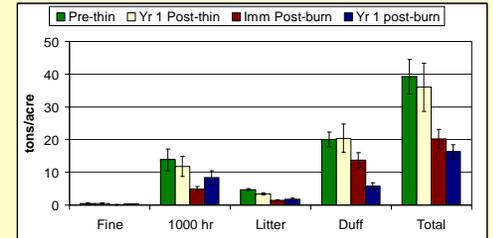
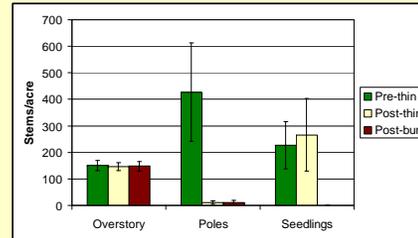


**North Terrace**

- Size: 205 acres
- Thinning: Summer/Fall 2001 (~2200 slash piles)
- Piles Burned: January 2002 – March 2003
- Prescribed Fire: September 22, 2005

The treatment prescription called for removal of trees < 15 cm DBH. Five standard Fire Monitoring Handbook (FMH) forest plots were installed within the project area. Tree density and fuel results are shown at right with standard error bars. Pole tree densities were reduced from 427 to 10 stems/acre after the thinning. Seedlings were virtually eliminated with the prescribed fire and total fuel load was reduced by more than 58%.

## Devils Tower National Monument



Pre-thin: May 1, 2001

Post-thin: June 4, 2002

Post-pile burning: June 25, 2003

Immediate Post-burn: October 19, 2005

Year 1 Post-burn: July 12, 2006



## Lafferty Gulch

- Size: 115 acres
- Thinning: Summer 2003 (~3500 slash piles)
- Piles Burned: January 2004 – present (~160 piles remain)
- Mt. Rushmore 1 Fire: Feb. 26 – Mar. 3, 2006

The prescription called for removing trees < 15 cm DBH while leaving 20 pole-sized trees/acre throughout the unit. Twenty circular plots were randomly located within the unit to assess tree mortality and fuels. Tree density and fuel results are shown below right with standard error bars. The thinning project reduced pole tree densities from 450 to 37 stems/acre.

During the pile burning operation in late February 2006, an abnormally warm and windy weather event resulted in about 96 "bonus" acres burned. Although this caused much angst in the regional office the results were really quite positive. Total fuel load was reduced by over 76%.

## Mount Rushmore National Memorial

Pre-thin: May 28, 2002

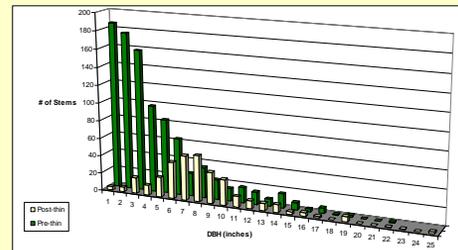
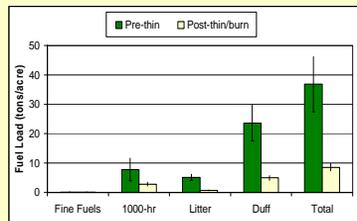
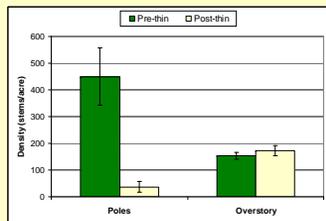
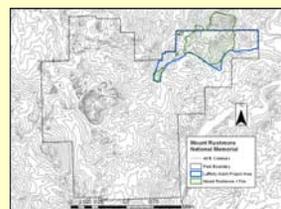
Post-thin: September 11, 2003

Post-pile burn: May 2, 2006



## Stand Structure

Thinning produced dramatic changes in the structure of this stand. The figure below illustrates pre- and post-thin stand structure. Trees smaller than 13 cm DBH composed 75% of the pre-thin stand while this size class composed only 19% of the post-thin stand. It appears that the thinning prescription was followed very well by greatly reducing, but not eliminating the pole-size trees.



## Cost Comparison

	North Terrace	Lafferty Gulch
<b>Size</b>	Rx Fire – 205 acres; Thin – 102 acres	115 acres
<b>Thinning</b>	\$40,659 \$398.62/acre	\$58,856 \$511.79/acre
<b>Pile Burning</b>	\$5,249 \$51.46/acre	\$4,131 \$35.93/acre
<b>Prescribed Fire</b>	\$49,208 \$240.04/acre	N/A

## Conclusion

Both mechanical fuel reduction projects have been successful in reducing the number of small diameter trees and fuel loads. However, there were some differences in costs of the two projects. The thinning portion of Lafferty Gulch was contracted out while North Terrace was done primarily in-house. There was also considerably more thinning done at Lafferty Gulch, evidenced by the number of piles created. There were differences in costs of the pile burning operation as well. The greater cost to burn the piles at North Terrace was probably the result of costs associated with travel to Devils Tower from Wind Cave, including lodging and per diem.

## Acknowledgements

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