Fuels Treated.. What Next?



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Overview

- Fuels Management
  - *Thinning*
  - *Rx fire*
  - *Mastication*
- Beyond Triage..
- *Thinking Big and Far*

Goals of Fuels Management

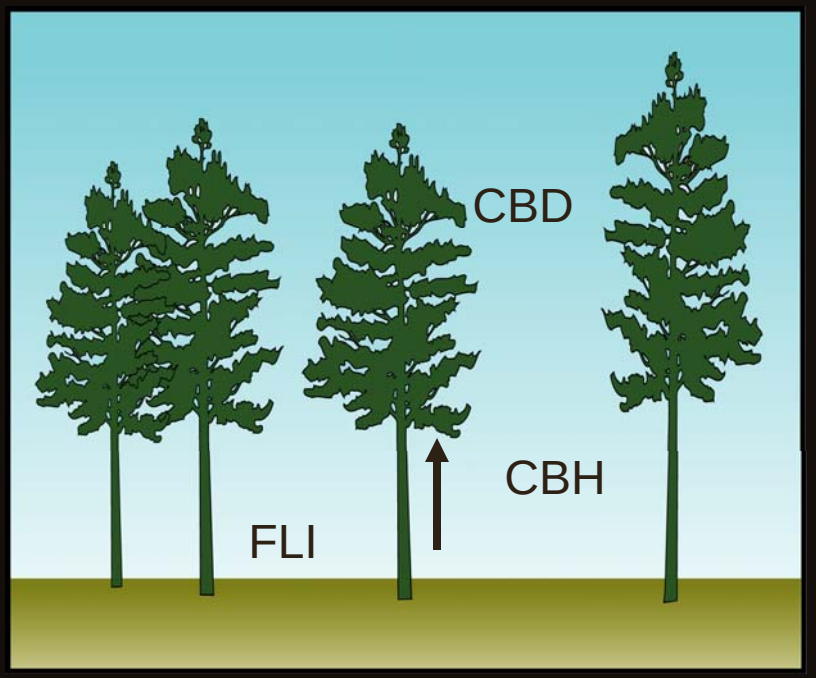
- Decrease fire intensity
- Prevent crown ignition
- Prevent canopy spread

- Maintain large trees
- Treatments should persist
- Treatments should "do no harm"

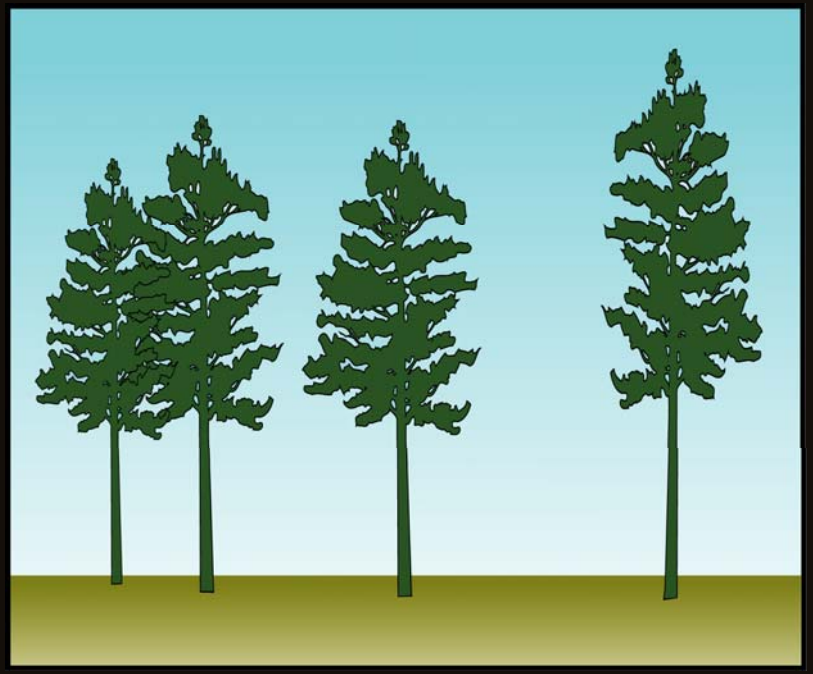
Agee and Skinner 2005 *Forest Ecology & Management;*

Keyes and Varner 2006 *Fire Management Today*

Fuels Management Strategies



Silvicultural Manipulation of Canopy Fuels

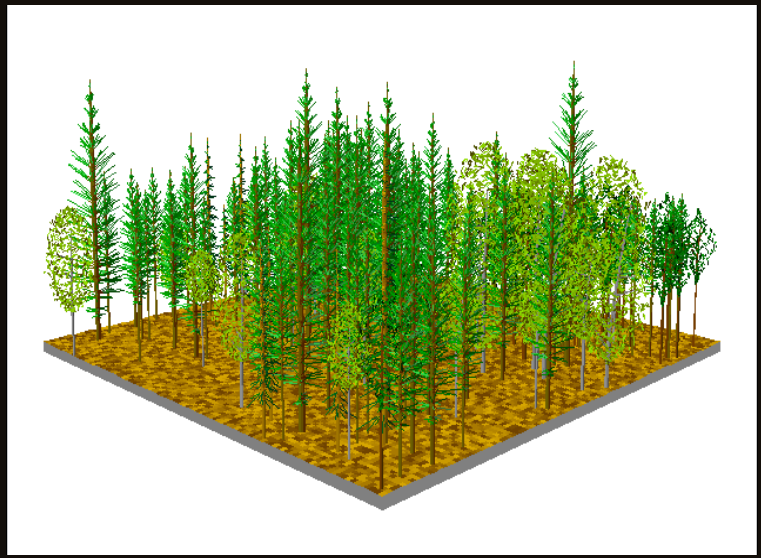


Pitfalls of Manipulation

The Absence of Long-term Data: When to treat again?

Short-term Responses to Long-term Processes

- Few address responses > 5 years
- Few address multiple trt or “maintenance regimes”
- Modeling approaches ignore pitfalls
- Most focus on small-scale “intensive” treatments
  - Few incorporate any heterogeneity (cookbook examples)



How long will it take to dissipate slash hazards?

- Long 1915, Fahnestock and Dieterich 1962, Fahnestock 1968, Kill 1968, Waggener and Offord 1972, Albini and Brown 1978, Carlton and Pickford 1982, Christiansen and Pickford 1986, others

Table 1. Fuel loadings, litter and duff, and depth of fuelbed.

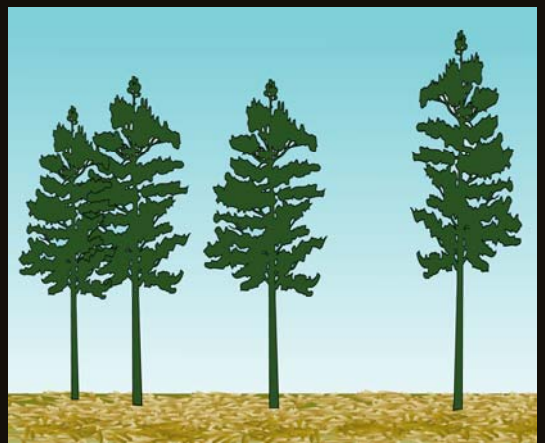
Age of slash	Average fuel loading by diameter class[1]					Depth		
	1-hr.	10-hr.	100-hr.	1,000-hr.	Total	Litter	Duff	Fuelbed
Yrs.	*Tons per acre*					*Inches*		
17	0.46	2.3	3.2	9.31	15.3	0.9	1.0	5.5
15	.29	2.4	4.1	6.66	13.4	1.5	1.1	7.5
13	.35	2.4	5.4	8.31	16.5	.7	.7	8.6
12	.30	2.2	2.4	4.15	9.0	1.1	1.2	5.3
11	.24	3.6	6.4	3.38	13.6	.5	.6	8.8
10	.14	2.5	4.1	7.53	14.3	1.2	.5	11.1
7	.57	2.7	4.5	6.60	14.4	.3	.5	11.0
6	.54	2.4	7.0	3.90	13.8	.3	.4	14.0
3	.52	4.2	4.5	10.53	19.8	1.0	1.3	11.9
2	.74	2.7	5.1	9.12	17.7	.6	.6	16.3
1	.73	4.1	4.3	7.58	16.7	.7	1.0	18.6
0	.05	.5	.4	2.30	3.2	.9	1.0	1.9

[1]Diameter classes are: 0–¼ inch = 1 hour; ¼–1 inch = 10 hour; 1–3 inches = 100 hour; 3–8 inches = 1,000 hour.

Carlton & Pickford 1982. *Journal of Forestry*

Mechanical mastication as a fuels management tool

Mastication Fuels Management Strategy



Effectiveness of Mastication

- Reduces shrub height, effectively eliminating many species
- Creates compact fuelbed
  - Low(er) fireline intensity
  - Mulches understory to stall vegetation recovery

Mastication “Pitfalls”

Year 2, X NF, California

Mastication "Pitfalls"

- Poor choice for sprouting species
- Dead fuel load increases
- Fuels made finer
  - 80% concentrated in 1- and 10-hr fuels
    - Kane et al. 2009 *Int. J. Wildland Fire*
- Long-duration heating to soil and trees
    - Busse et al. 2005 *Int. J. Wildland Fire*; Kreye et al. *Submitted*

Research Needs for Mastication

- Multiples species
  - Sprouters
  - Variable recolonizers
- Long-term response
- Varied treatments
  - Season
  - Intensity
- Ecological effects (vegetation, soil, fauna)
  - Little work to date

Prescribed fire as a fuels management tool

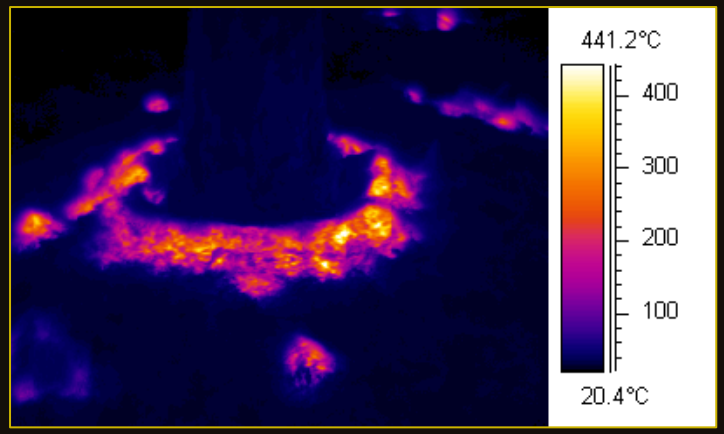
Fire as fuels management

Long-unburned with little torching potential: keep big trees

Reduce fuels **Retain large pines**

Results: Across species

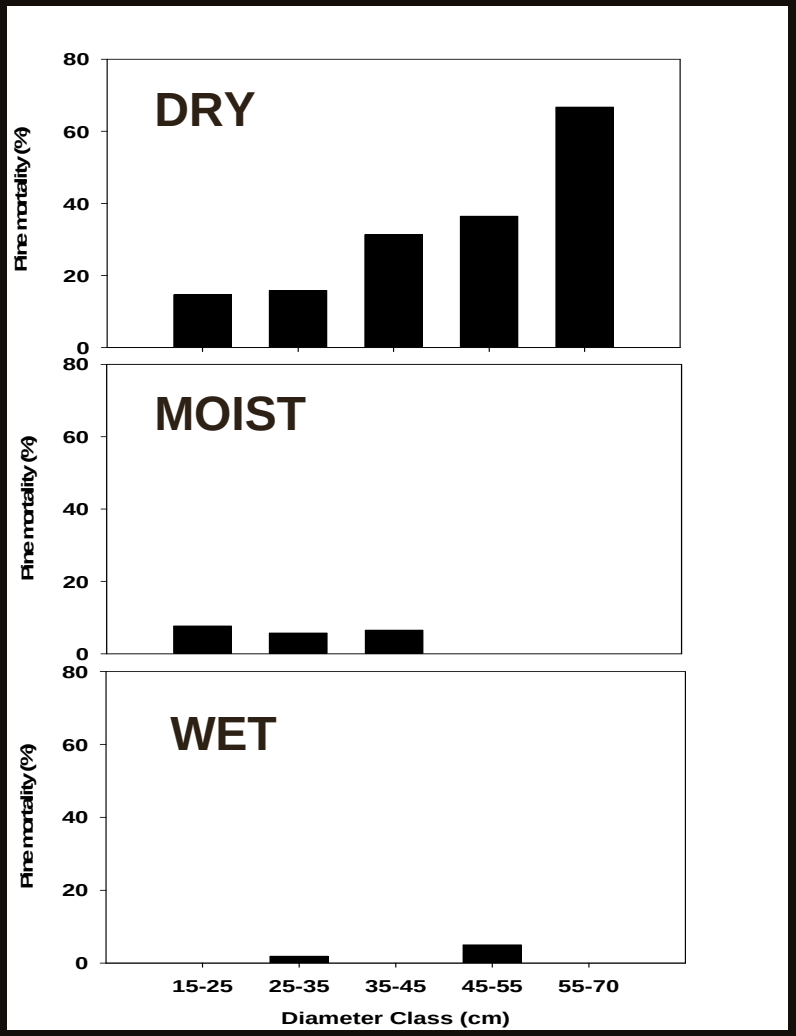
- Heavy mortality
- Smoldering emissions



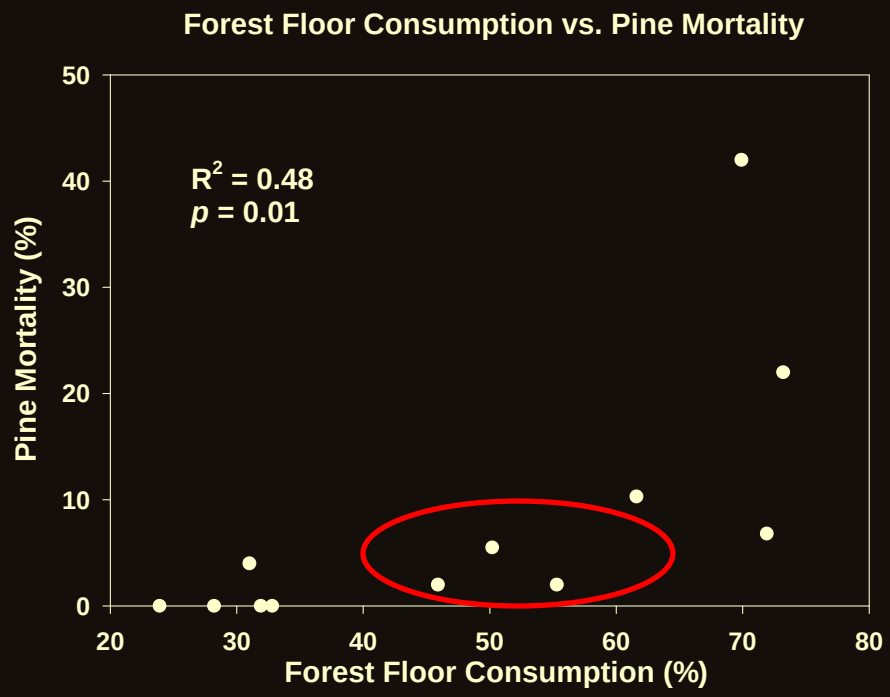
- Ponderosa pine, Douglas-fir, giant sequoia, sugar pine, Jeffrey pine, many others

Review: Kolb et al. 2007 *Forest Ecology & Management*

Recent Advances: Fire to retain large trees



- Duff moisture as guide



Varner et al. 2007 *Can. J. For. Res.*

Use of prescribed fire as a fuels *maintenance* tool

- Retard midstory recovery

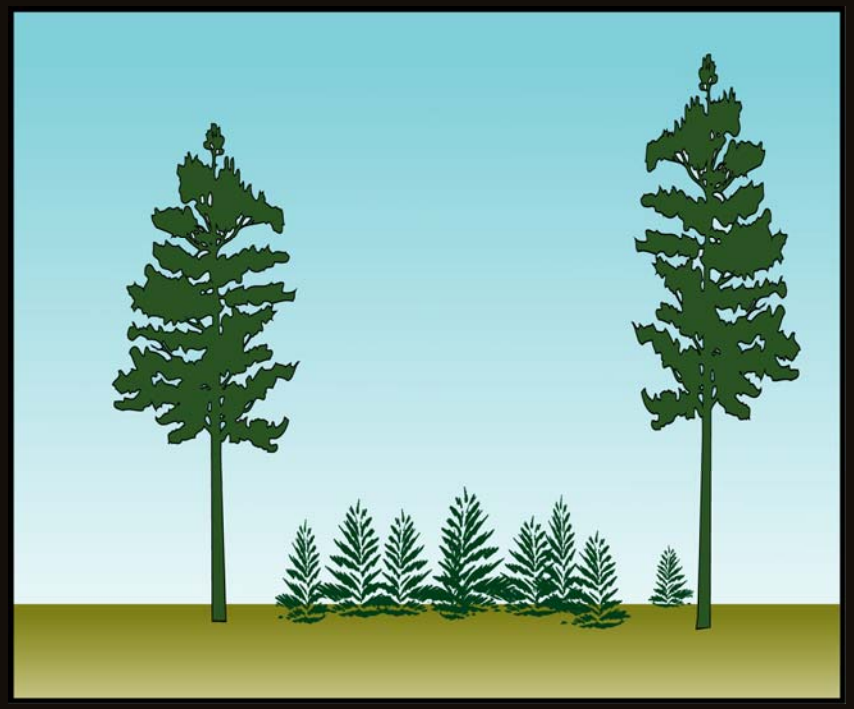


Table 2
Predicted average flame lengths under typical prescribed fire conditions required to kill 95% of ponderosa pine regeneration for different age classes in the Blacks Hills, SD

Age (years)	Average height (m)	Predicted average flame length (m)
5	0.20	0.23
10	0.62	0.61
16	1.37	1.28
20	1.98	2.21
25	2.87	2.61
30	3.90	3.06
35	5.04	3.57
40	6.30	4.14

Can prescribed fire be used to maintain fuel treatment effectiveness over time in Black Hills ponderosa pine forests?

Battaglia et al. 2008 *Forest Ecology & Management*

Research Needs to Advance Fire Use as a Fuels Management Strategy

- Retain large trees
  - Forest-floor driven burning
    - Early season burning
    - Capitalizing on duff moisture
  - Investigate raking treatments
- Maintenance Tool
  - Design prescriptions that kill ingrowth while perpetuating large trees

What Now? Where Now?

- *Fire moves across the landscape, ignoring breaks…*

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Evidence from the Edge

Healing the Wounds

- Fuelbreaks were intended as band-aid… wounds healed with landscape treatment
  - Fire
  - Thinning

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FIRE SAFETY

FIRE-RESILIENT FORESTS