

Post-blowdown Salvage Logging Impacts on Fuel Loads and Fire Severity in Jack Pine Stands: Preliminary Results

Presenters: Laura Dunn and Doug Shinneman

Collaborators: John Bradford, Tony D'Amato, Shawn Fraver,
Terrie Jain, Doug Kastendick, and Brian Palik



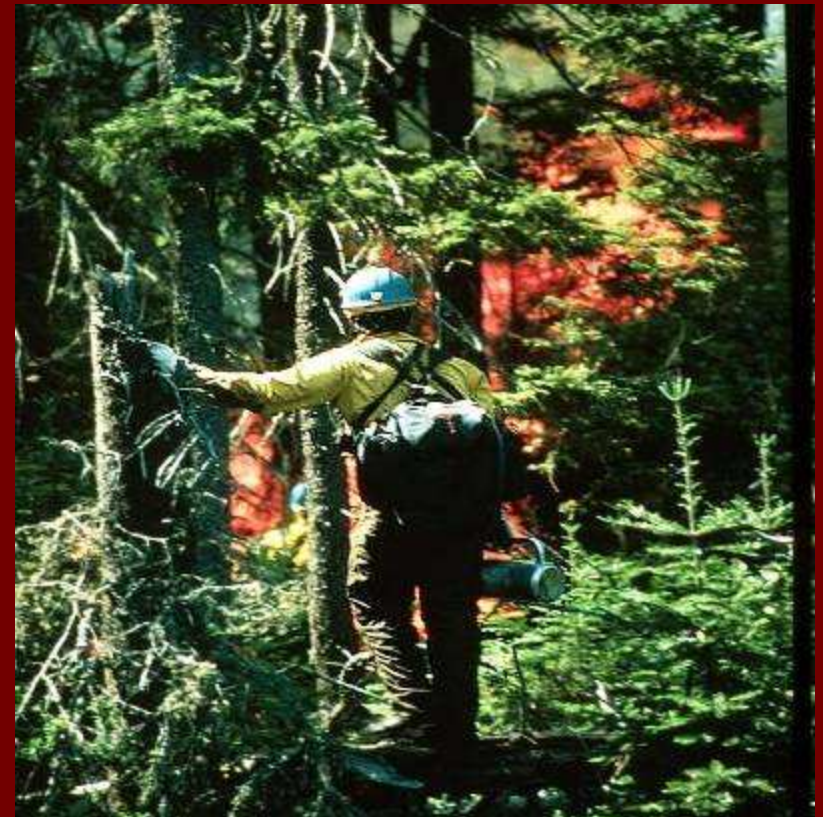
Joint Fire Science Program

- Interagency Fire Research Consortium
 - U.S. Forest Service
 - National Park Service
 - Bureau of Land Management
 - U.S. Fish and Wildlife Service
 - Bureau of Indian Affairs
 - U.S. Geological Survey

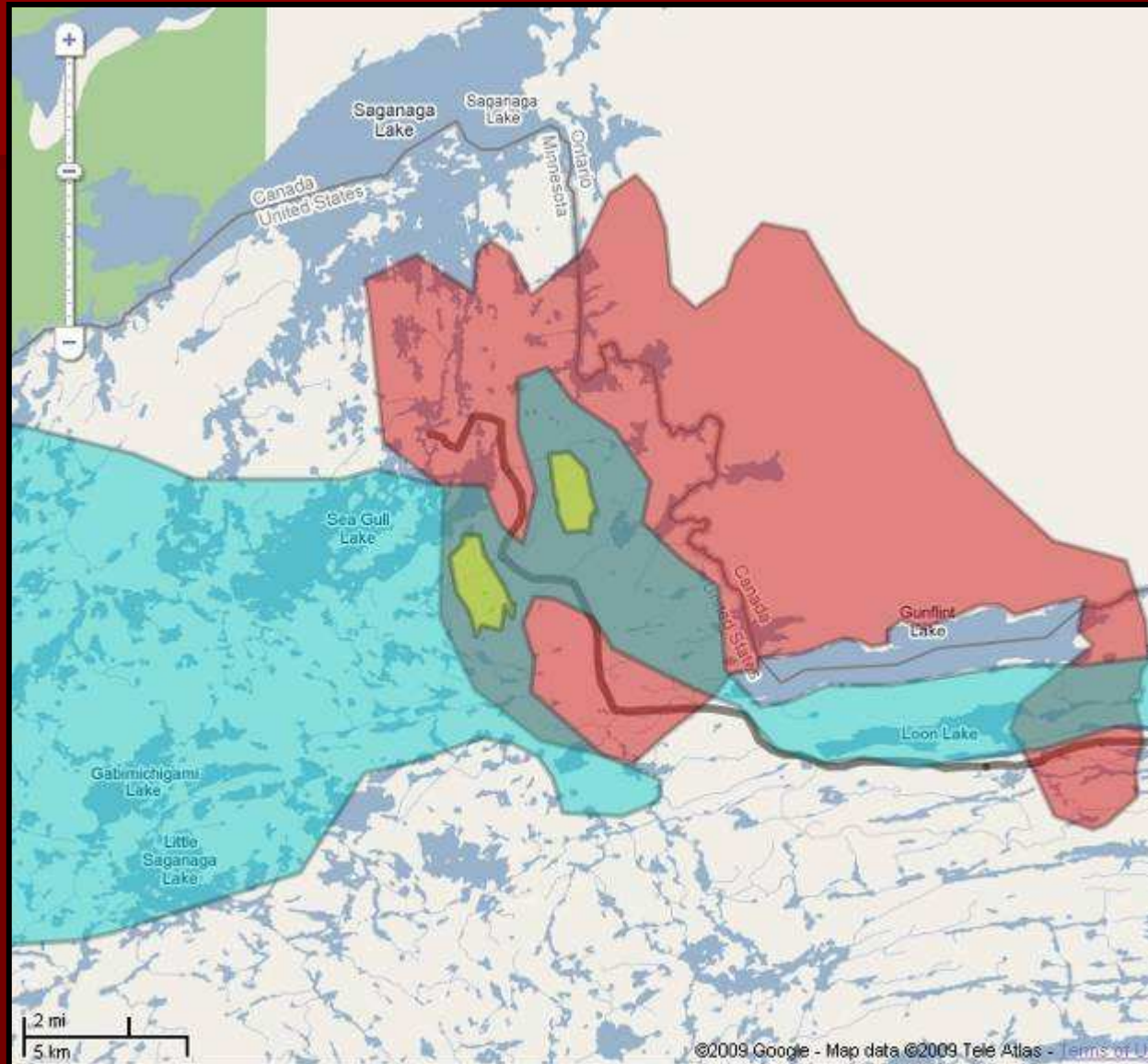
JFSP Goal: Information Flow

From...

To...



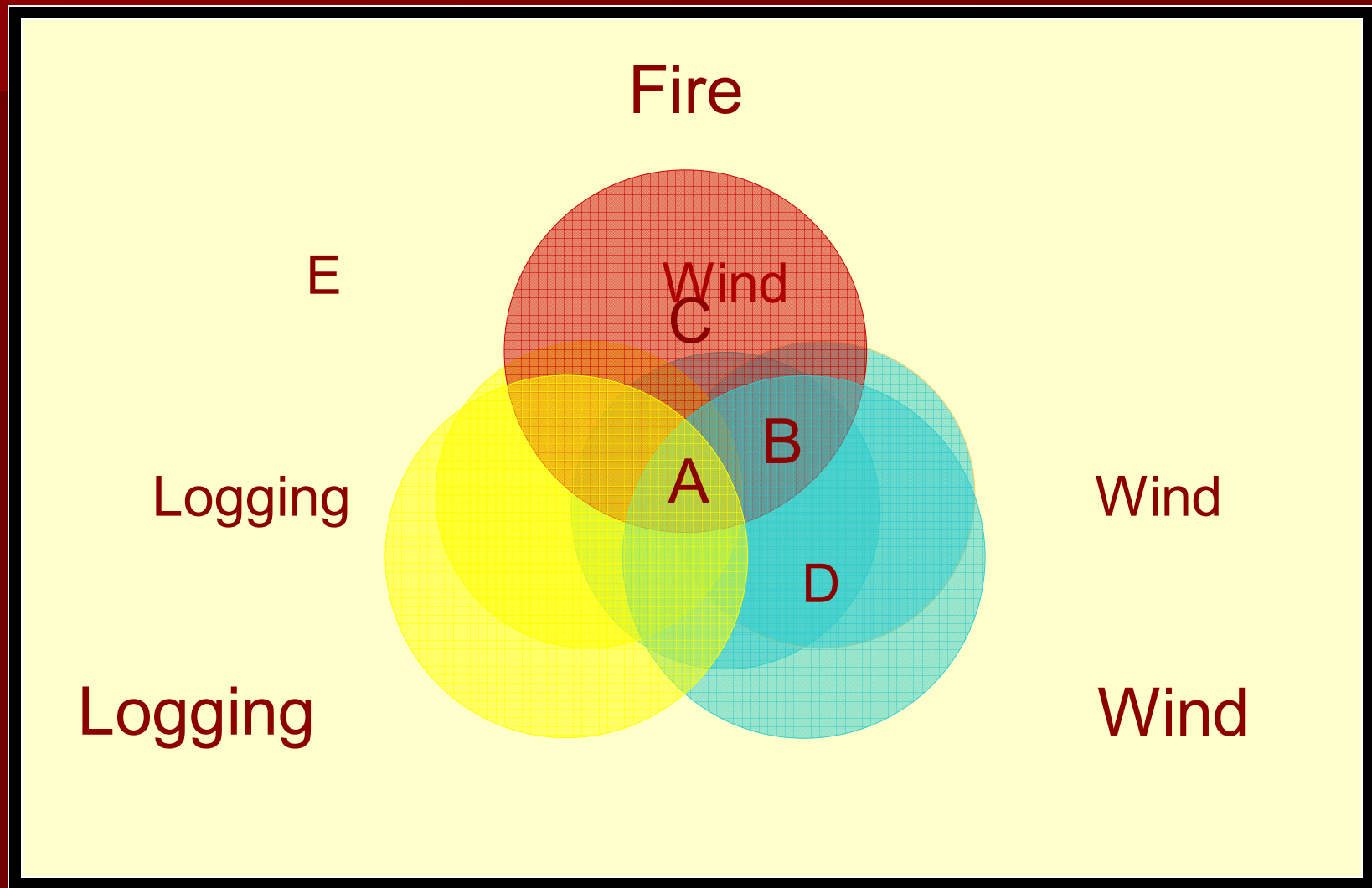
Map of 3 Disturbances



- Blue= Blowdown
- Yellow= Salvage Logging
- Red=Ham Lake Fire



Possible Disturbance Interactions



Sampling Design

- 5 Treatments
- 6 Sites per Treatment
- 8 Plots per Site
- Total Plots=240
- Plot= 8m radius

Treatment	1999 Blowdown	Salvage Logging	2007 Wildfire
A	YES	YES	YES
B	YES		YES
C			YES
D	YES		
E			

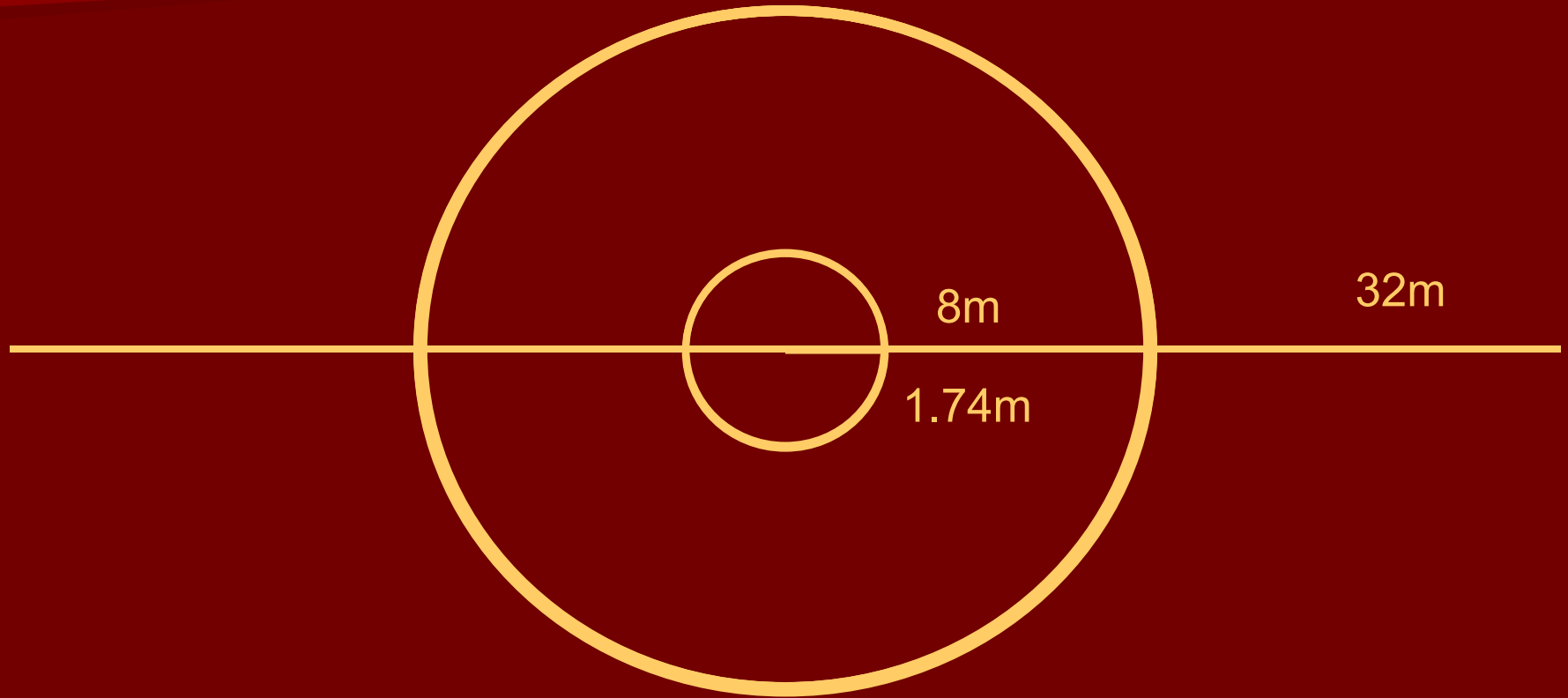


Research Questions:

1. How have these disturbances affected
 - current fuel loads
 - regeneration
 - total carbon storage (above ground)
2. How did the blowdown and salvage logging influence the 2007 fire severity?

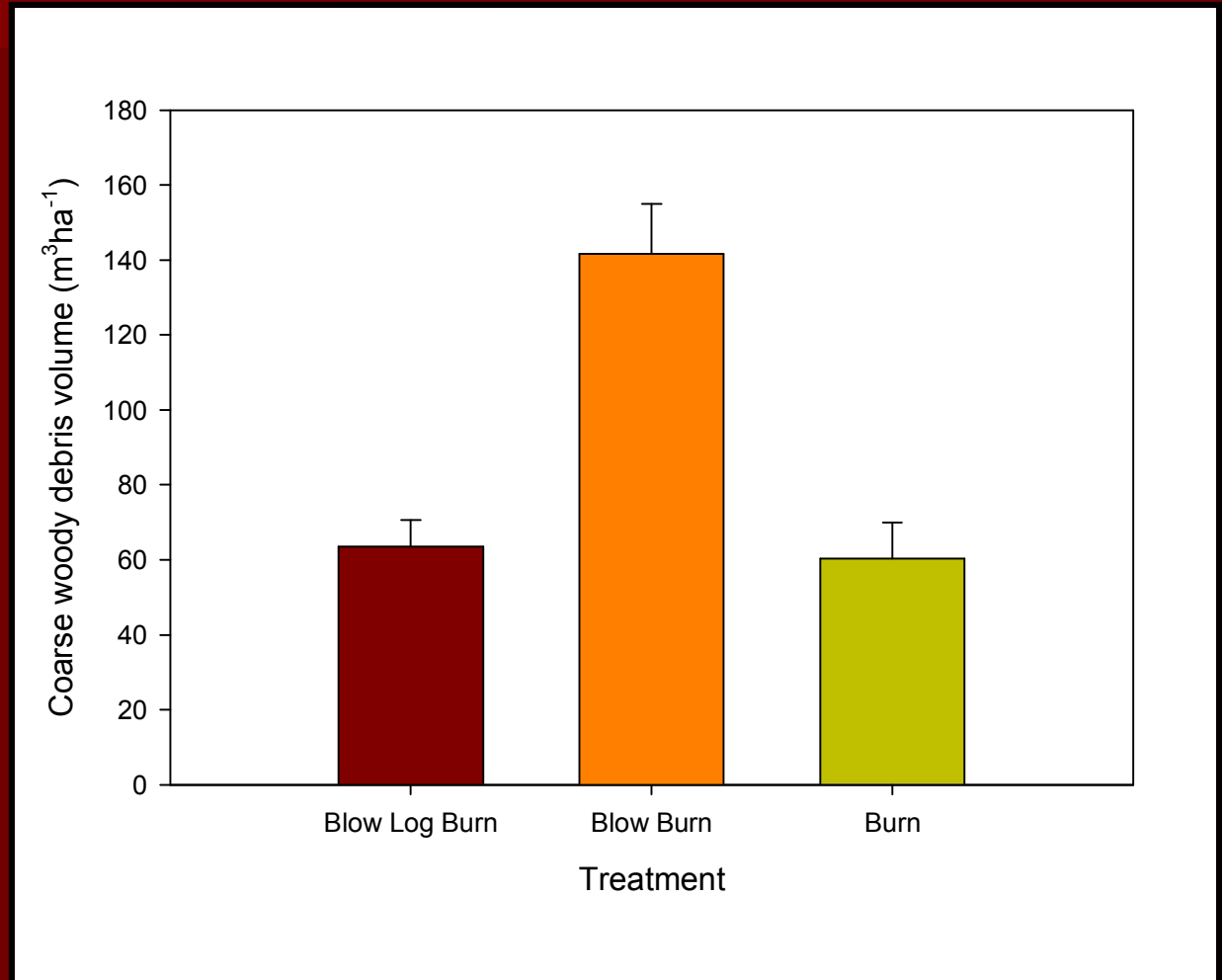


Plot diagram



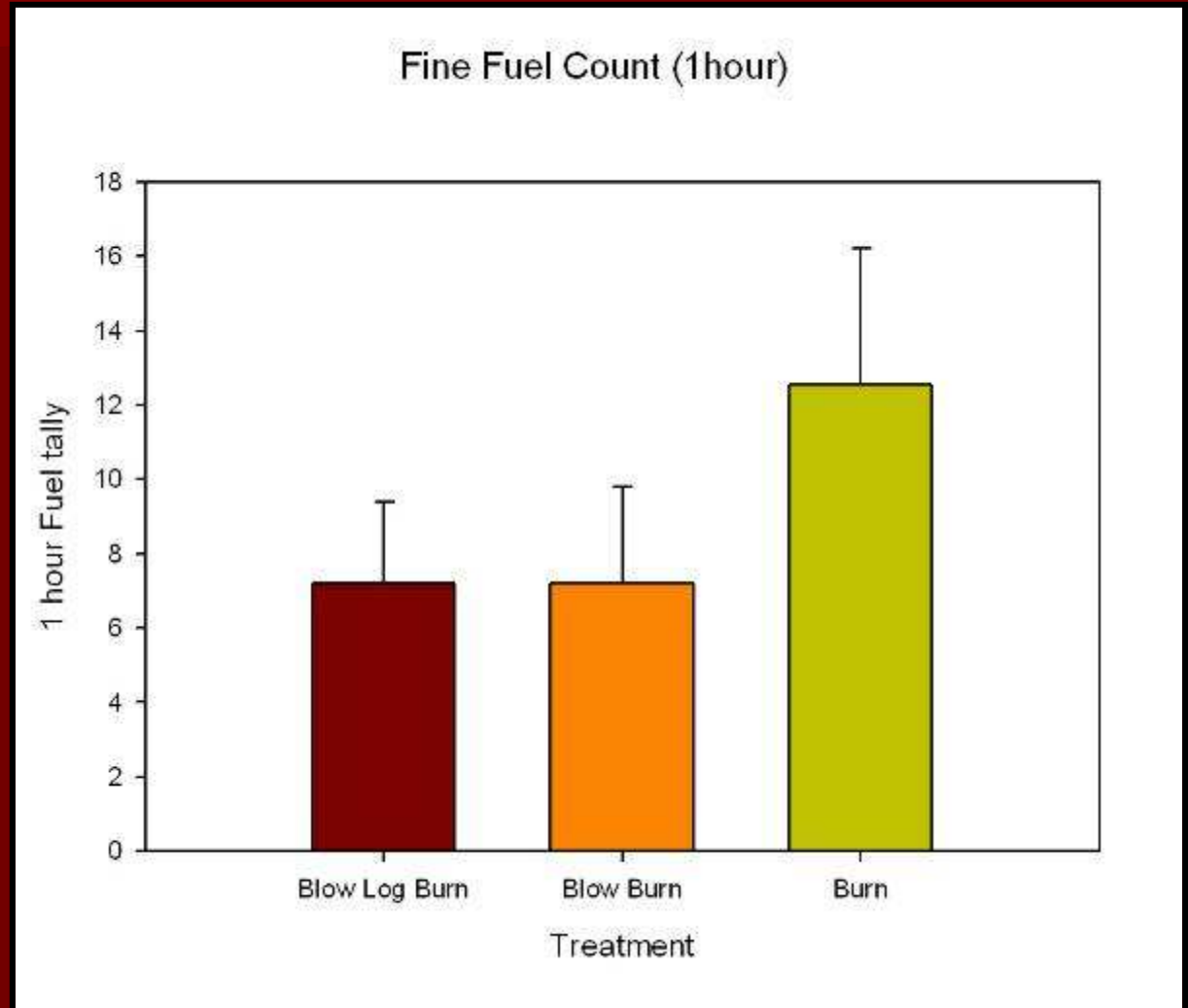
Results: Coarse Woody Debris

- Logging appears to reduce CWD to pre-blowdown levels



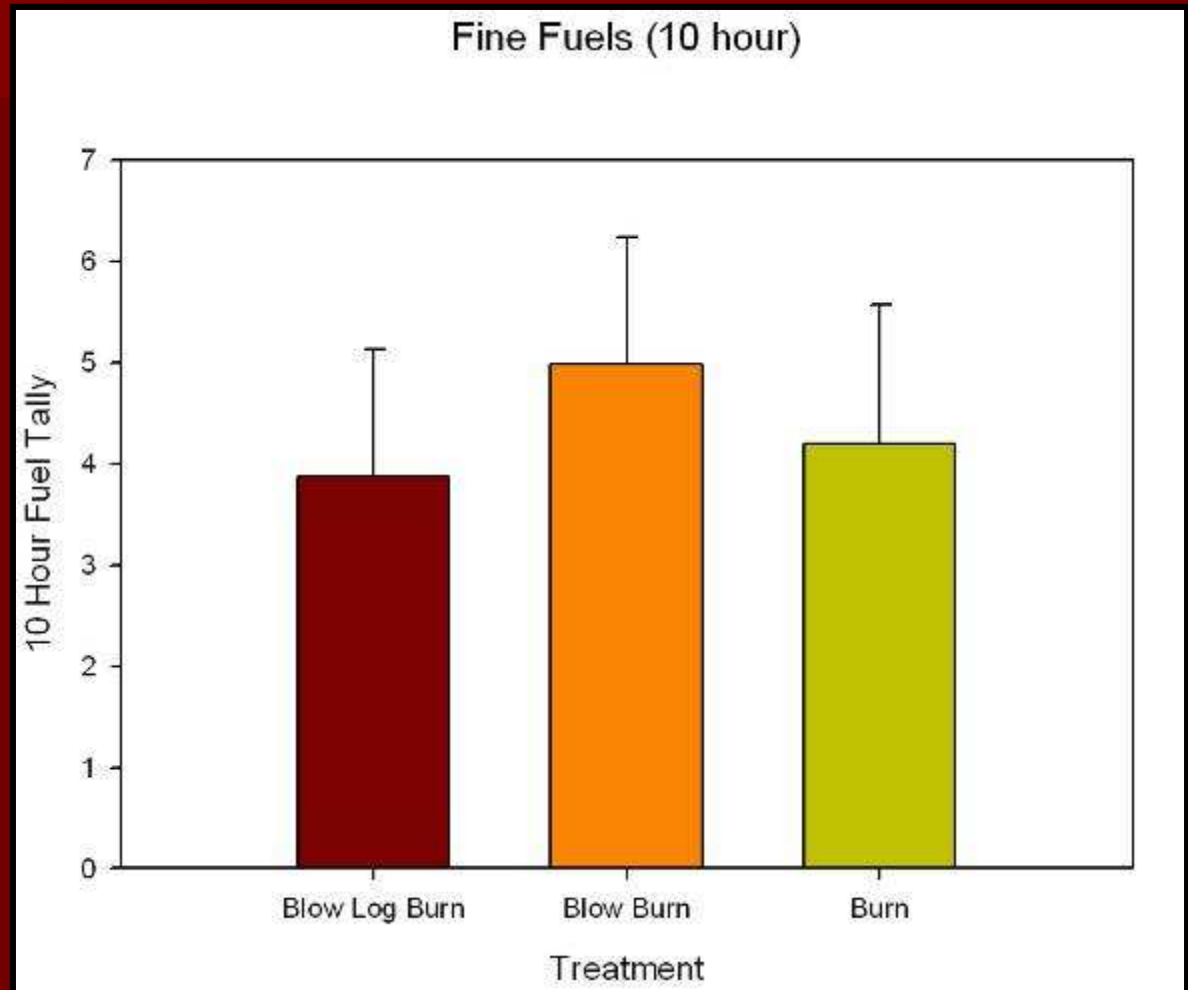
Results: Fine Fuels

- Logging has little effect on 1 hour fuels
- Burned sites appear to have highest 1 hour fuel levels



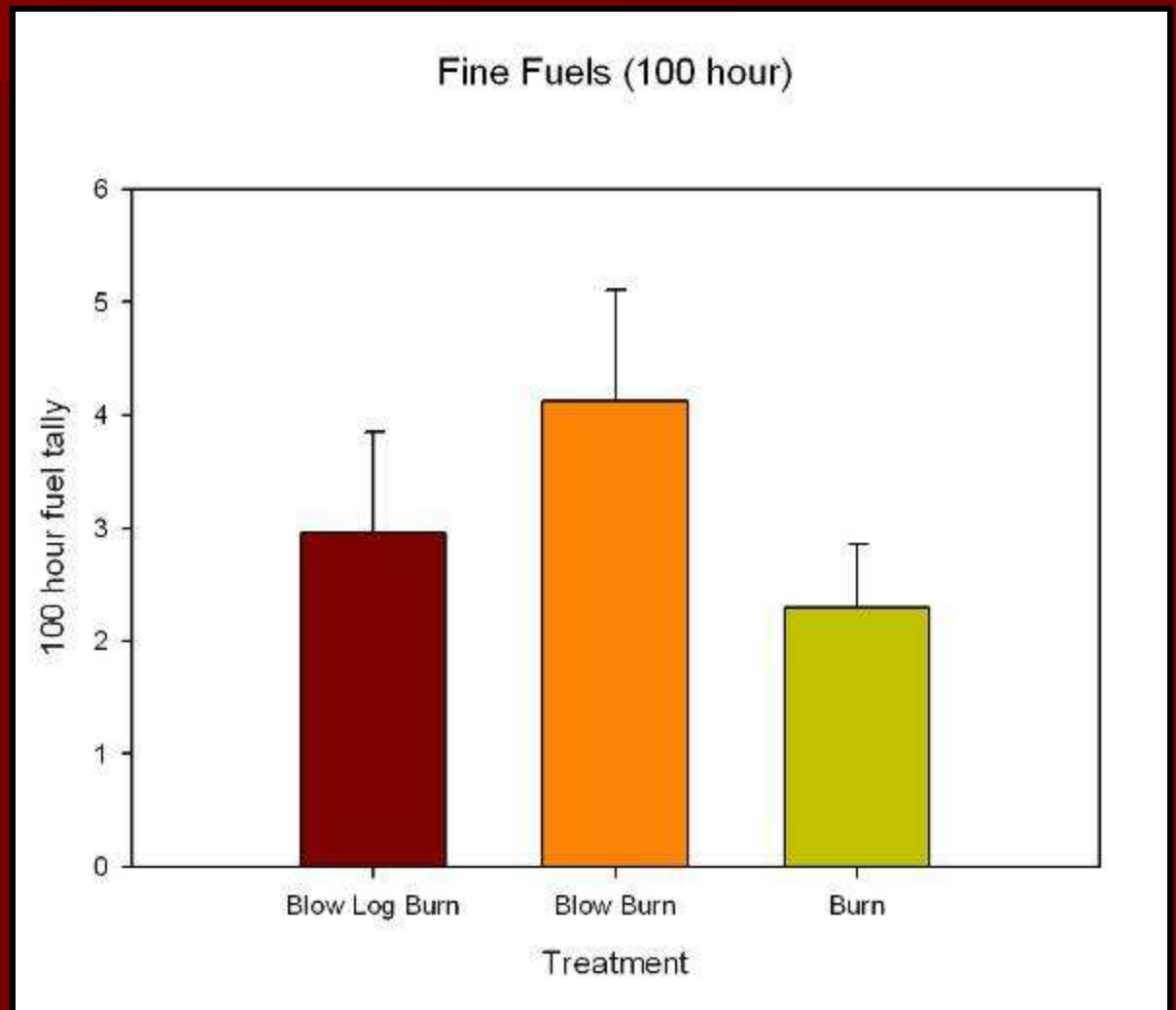
Results: Fine Fuels

- No significant differences detected between treatments for 10 hour fuels
- However, must remember that these sites ALL burned



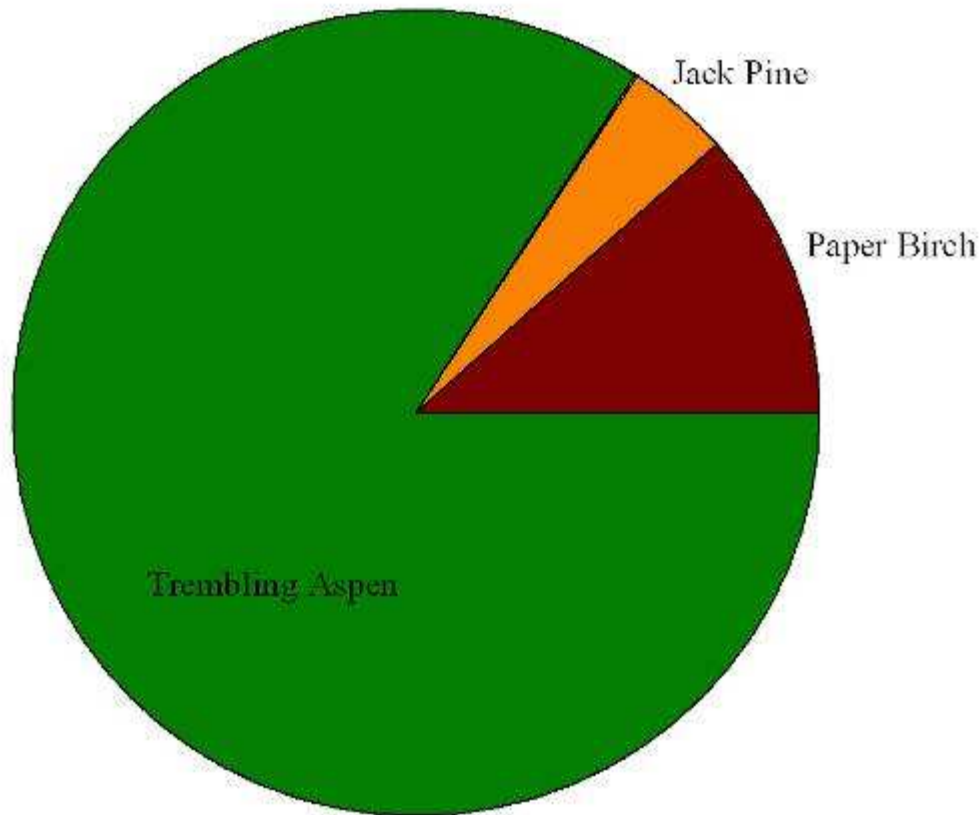
Results: Fine Fuels

- B treatment is significantly different with both other treatments for 100 hour fuels
- Logged stands are not quite significantly different than burned stands



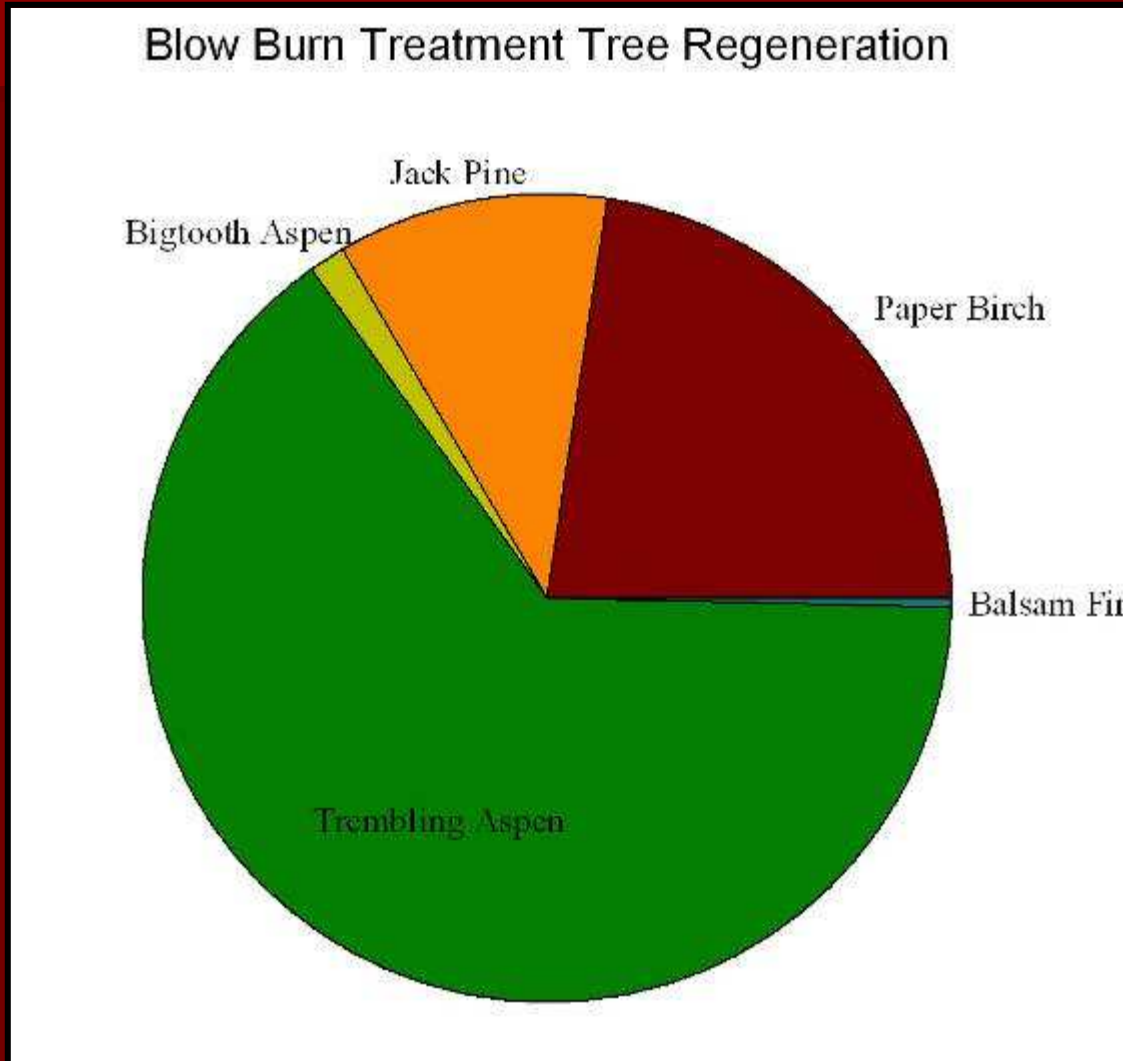
Results: Regeneration

Blow Log Burn Treatment Tree Regeneration



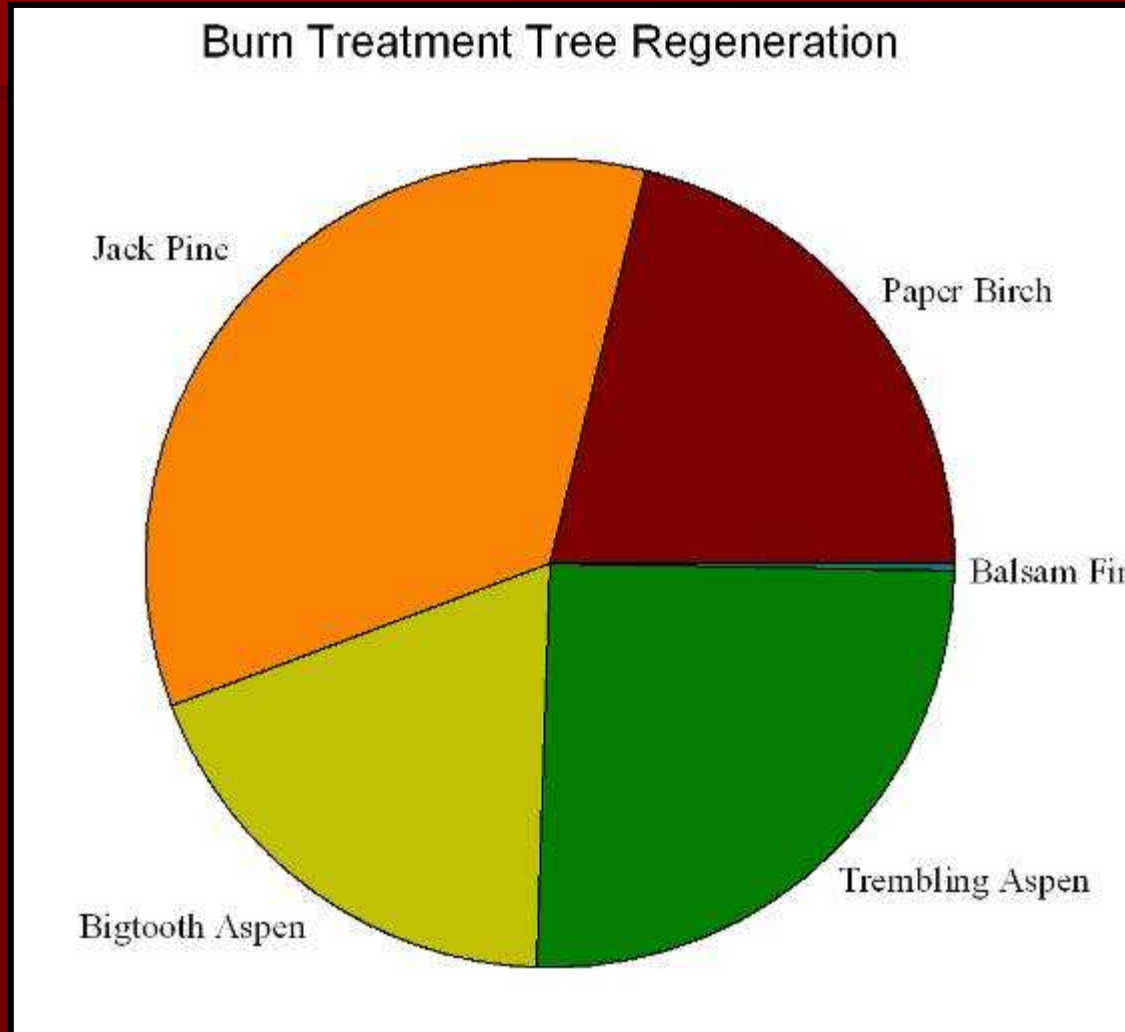
- Aspen regeneration dominates logged treatment ~85%
- Seedlings/ha = 95,000

Results: Regeneration



- Aspen regeneration still dominating blow burn treatment ~65%
- Seedlings/ha = 70,000

Results: Regeneration



- More even distribution of species in burn treatment
- Jack Pine ~35%
- Seedlings/ha = 88,000

Initial conclusion (Part I)

- Salvage logging appears to reduce overall fuel load
- But...has limited effects on fine fuels

- Salvage logging appears to reduce Jack Pine and Balsam Fir regeneration
- But... increases Aspen regeneration

Part II – Does salvage logging reduce fire severity?



Canadian Forest Service



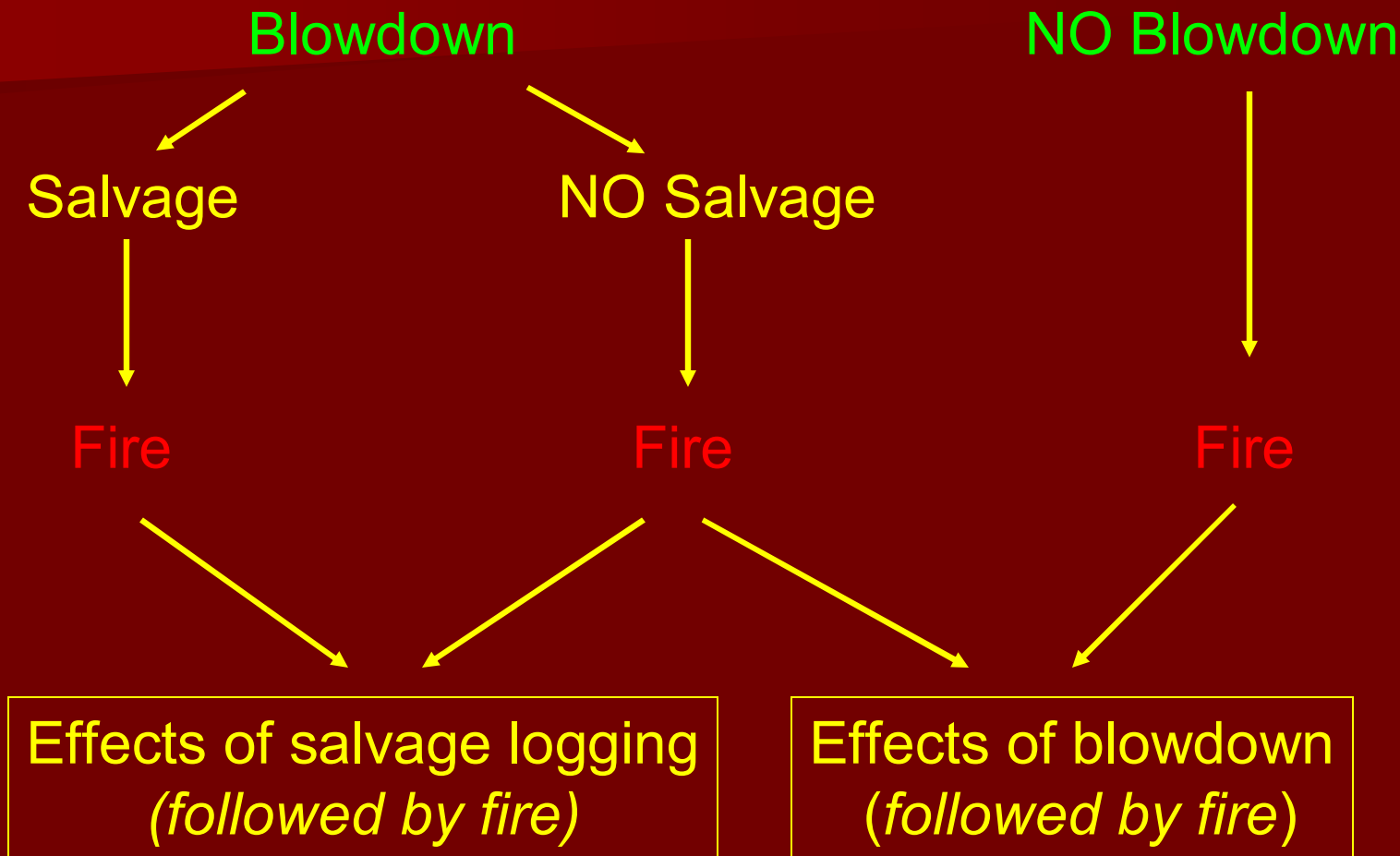
U.S. Forest Service

Severity of the Ham Lake Fire?



Treatment	1999 Blowdown	Salvage Logging	2007 Wildfire
A	YES	YES	YES
B	YES	NO	YES
C	NO	NO	YES

Given this sequence, we can evaluate...



How to Assess Severity?

Terrie Jain and Russell Graham: *The relation between tree burn severity and forest structure in the Rocky Mountains*
(USFS PSW-GTR-203, 2007)

These methods differs in two ways:

- Focus on the post-fire environment: What conditions are left after the fire?
- Include separate assessments of forest-floor severity and tree-crown severity

Creeping Surface Fire



Crown Fire

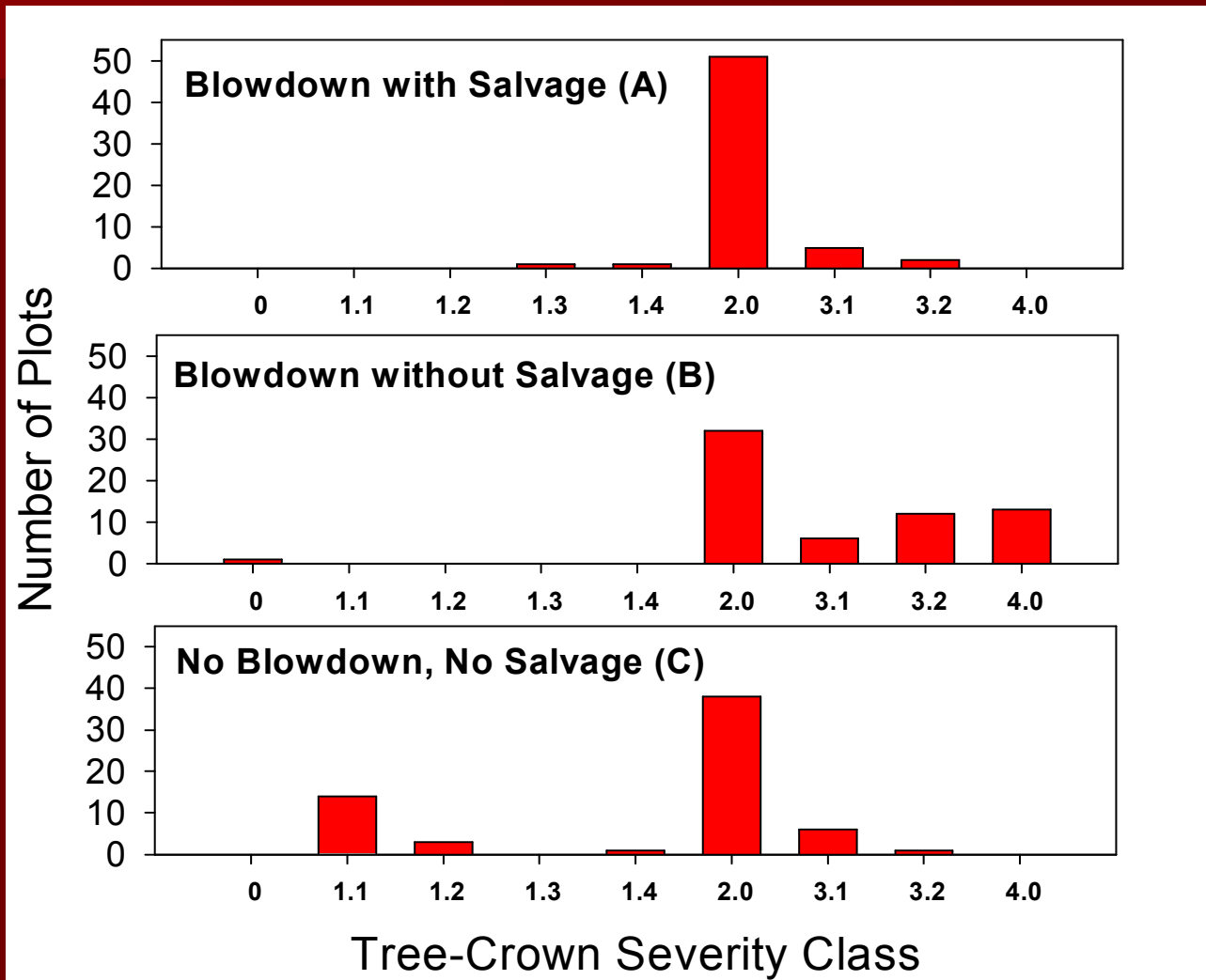


Photo: Keifer Photo

Tree-crown Severity Key

Characteristics	Index
A₁ No evidence of recent fire	0
A₂ Evidence of recent fire	
B₁ Presence of green crowns on Dominant + Codominant trees	
C₁ Plurality of Dominant + Codom. trees > 60% green crown	1.1
C₂ Plurality of Dominant + Codom. trees 30 - 60% green crown	1.2
C₃ Plurality of Dominant + Codom. trees 15 - 30% green crown	1.3
C₄ Plurality of Dominant + Codom. trees < 15% green crown	1.4
B₂ Dominant + Codominant trees > 98% brown	2.0
B₃ Transition: A mixture of brown and black crowns	
C₁ Plurality of brown-crowned trees	3.1
C₂ Plurality of black-crowned trees	3.2
B₄ Dominant + co-dominant trees >98% black	4.0

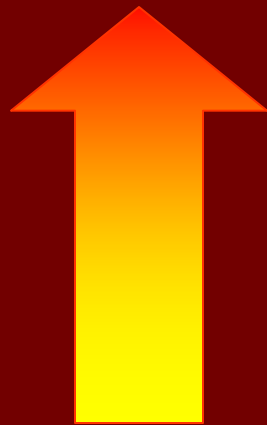
Tree-Crown Severity



Preliminary analysis Results: Tree-Crown Severity

Statistical Model:

Tree-crown Severity = f (Treatment A, B, C)



Blowdown without Salvage (B) >>

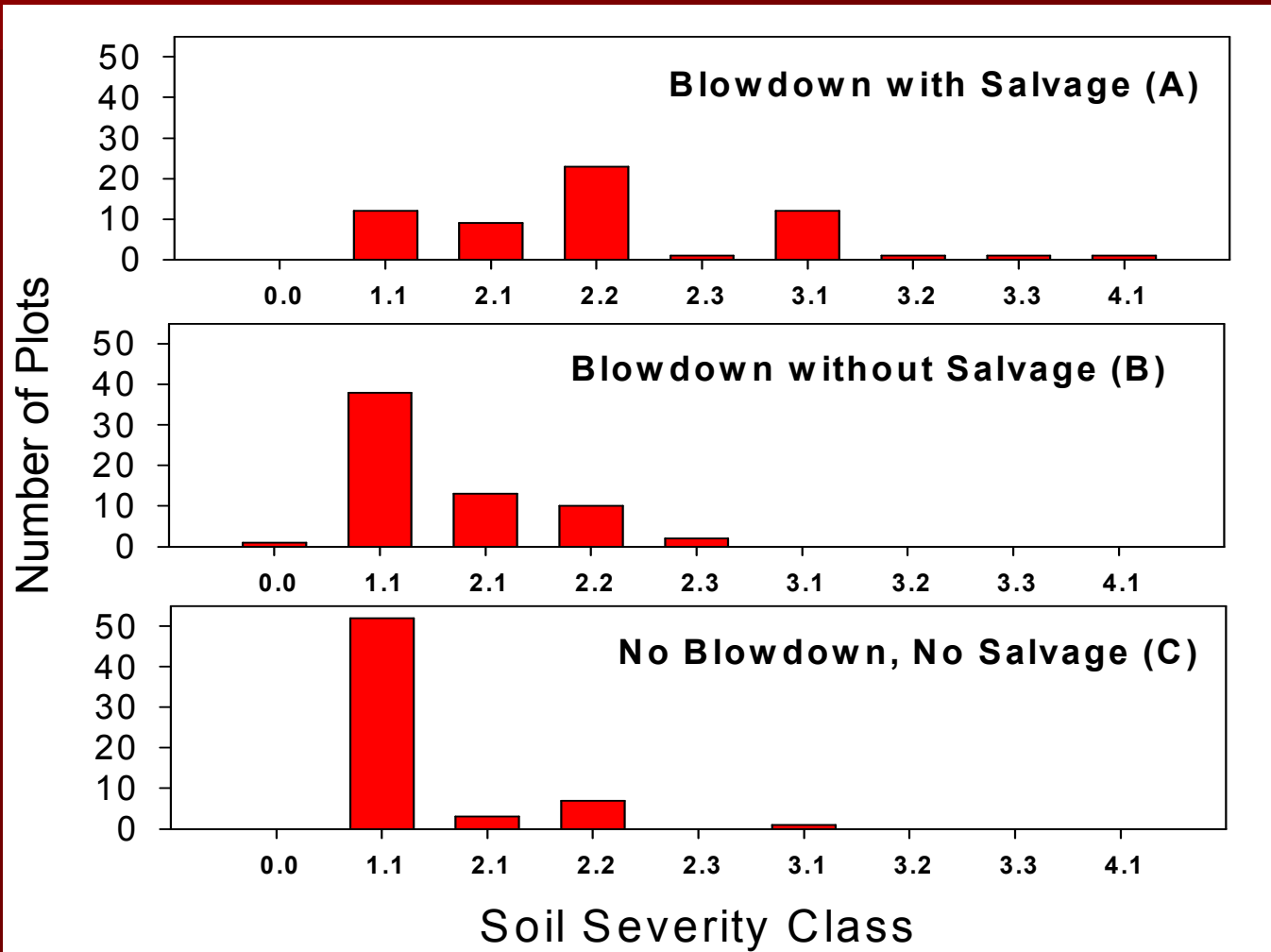
Blowdown with Salvage (A) >>

No Blowdown, No Salvage (C)

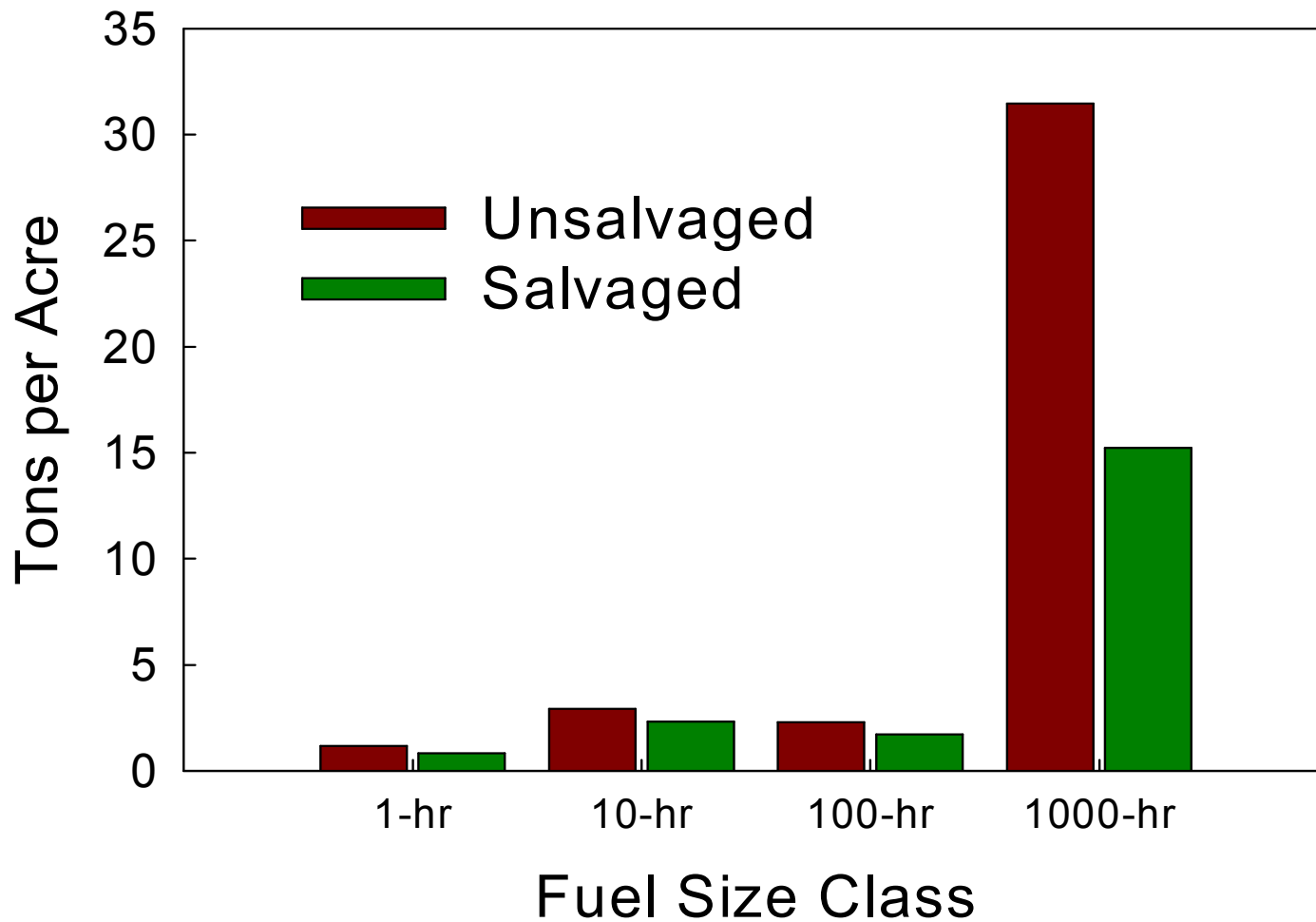
Soil Severity Key

	<u>Characteristics</u>	<u>Index</u>
A ₁	No evidence of recent fire	0
A ₂	Evidence of recent fire	
B ₁	Pre-fire surface organics cover > 85%	1.1
C ₁	Pre-fire surface organics cover 40 to 85%	
	Mineral soil appears unburned	2.1
	Black char dominates mineral soil	2.2
	Grey/White ash dominates mineral soil	2.3
C ₂	Pre-fire surface organics cover < 40%	
	Mineral soil appears unburned	3.1
	Black char dominates mineral soil	3.2
	Grey/White ash dominates mineral soil	3.3
C ₃	No pre-fire surface organics left	
	Mineral soil appears unburned	4.1
	Black char dominates mineral soil	4.2
	Grey/White ash dominates mineral soil	4.3
	Orange color dominates mineral soil	4.4

Soil Severity



Fuel Loadings *before* the Ham Lake Fire



Summary of initial conclusions

We covered these relationships:

1. Salvage logging → fuel loads, etc.
2. Salvage logging → fire severity

Are fuel loads the mechanism for the second relationship?

An aerial photograph showing a large fire burning in a forest. Thick, white and grey smoke rises from the trees, partially obscuring the sky. The fire is concentrated in a central area, with smoke plumes extending outwards. The surrounding forest is green, and a river or stream is visible in the lower right corner.

Thank you

Questions?

- **Special thanks to the Superior National Forest (especially the Gunflint RD)**
- **Funded by: Joint Fire Science Program**

Photo: U.S.
Forest Service