

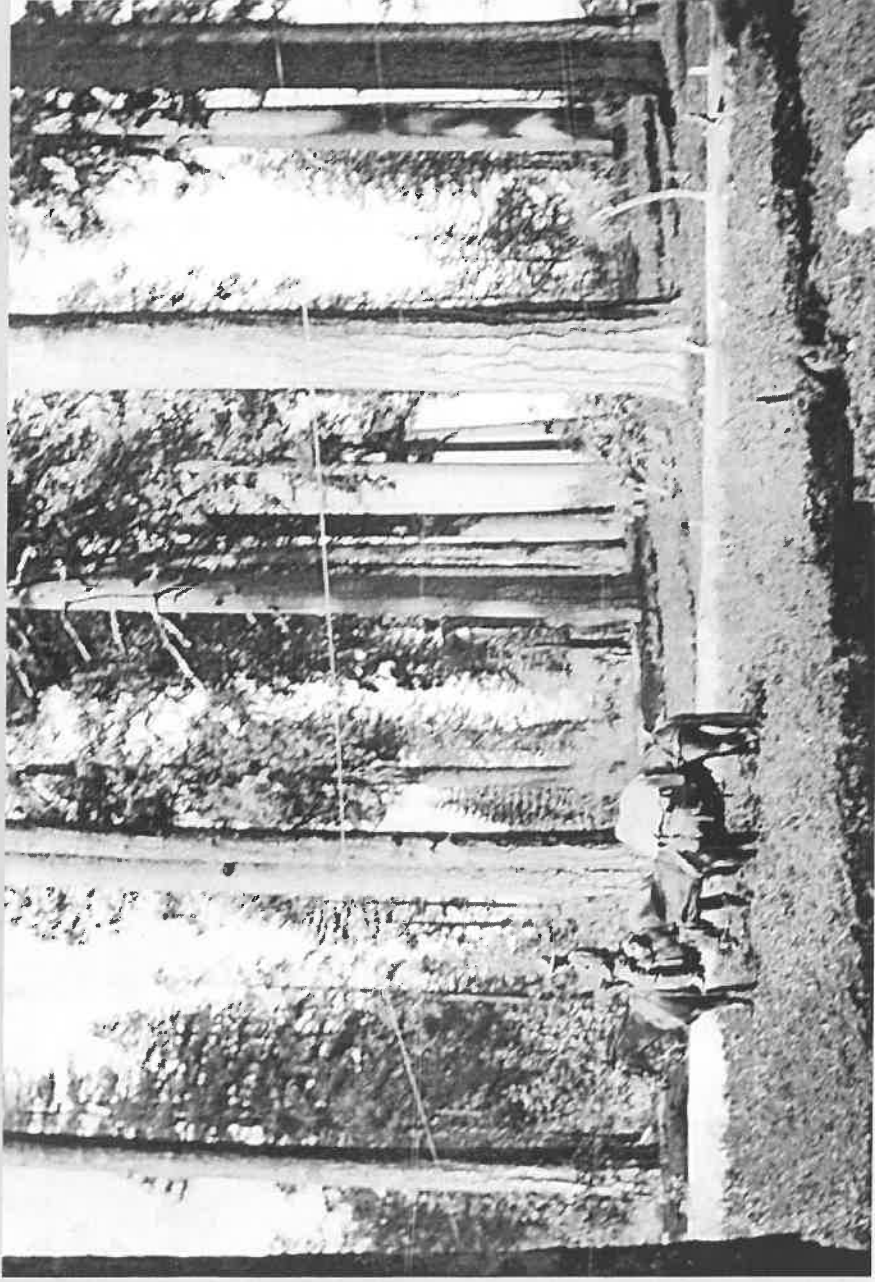
# **Forest change in California pine-mixed conifer forests: implications for forest health**

**Brandon Collins & many other co-authors**

# Historical forest conditions and fire effects

## Show and Kotok (1924):

“California pine forests\* represent broken, patchy, understocked stands, worn down by the attrition of repeated light fires.” ...

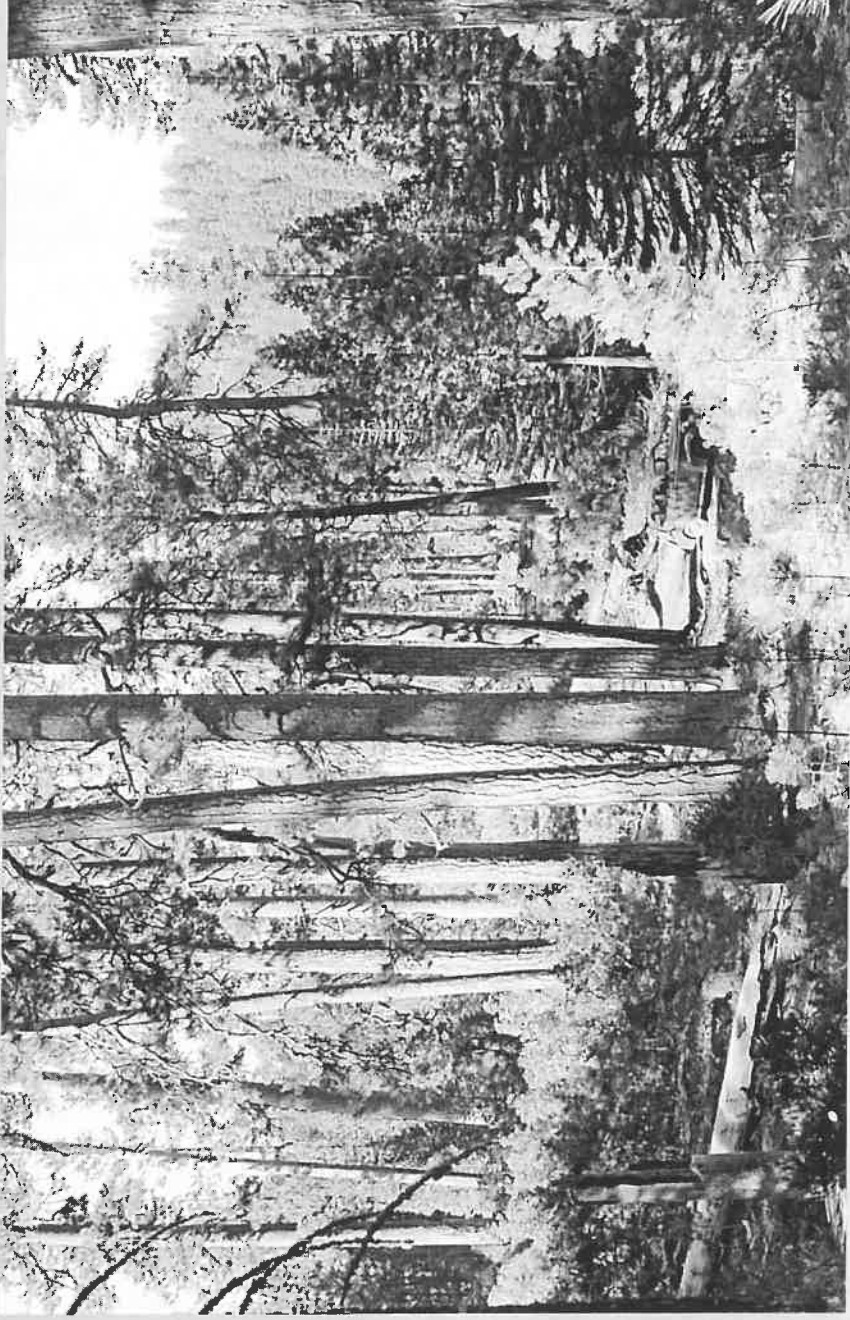


“Extensive crown fires...are almost unknown to the California pine region\*.”

\*including much of what is considered mixed-conifer today

## **Forest change: fire suppression & exclusion Show and Kotok (1924):**

**“That maximum protection or fire exclusion inevitably increases hazard by the encouragement of undergrowth is, of course, true, but such added hazard in no way vitiates the reasons for protection”**



UNITED STATES DEPARTMENT OF AGRICULTURE,  
FOREST SERVICE.

Tp 25, R. 20 E, M. 2 S, Sec. 19, Forty Course, D. 1. N. Series, 1911. Date 7-8-1911. Estimator F. H. COLLIER. Examiners J. R. BERRY. Compassman J. R. BERRY.

D. B. H.	Species		S.P.		Species		M.F.		Species		Miscellaneous Green; Dead (All Species)		
	Y.P.	Number of logs	Number of logs	Number of logs	Number of logs	Number of logs	Number of logs	Number of logs	Number of logs	Number of logs	Y.P.	S.P.	M.F.
INS.	1	4	1	4	1	4	1	4	1	4	4	4	10
12	✓												15
14	✓												10
16	✓												10
18													
20	4	7	4	7	4	7	4	7	3	4	4	4	3
22	✓												
24	✓												
26	✓												
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30	✓												
32	✓												
34	✓												
36	✓												
38	✓												
40	6	9	6	9	6	9	6	9	5	6	6	6	8
42													
44	✓												
46													
48													
50	✓												
52	✓												

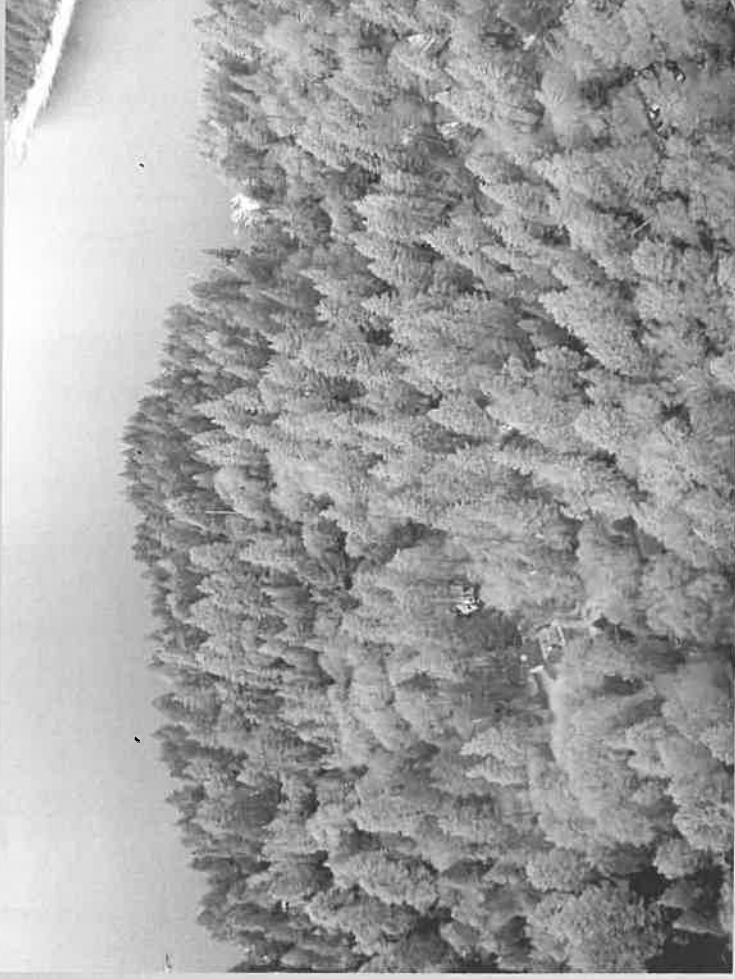
# Historical vs. current stand conditions: re-measurement of 1911 timber surveys

FS land only (n=55 transects)

Year	Basal area (ft <sup>2</sup> ac <sup>-1</sup> )	Tree density (ac <sup>-1</sup> )		Pine proportion	Shrubs (% cover)
		> 6 in.	>36 in.		
1911	72	20	4	0.56	20
2013	168	123	3	0.43	12



# Forests change: less resilient to drought



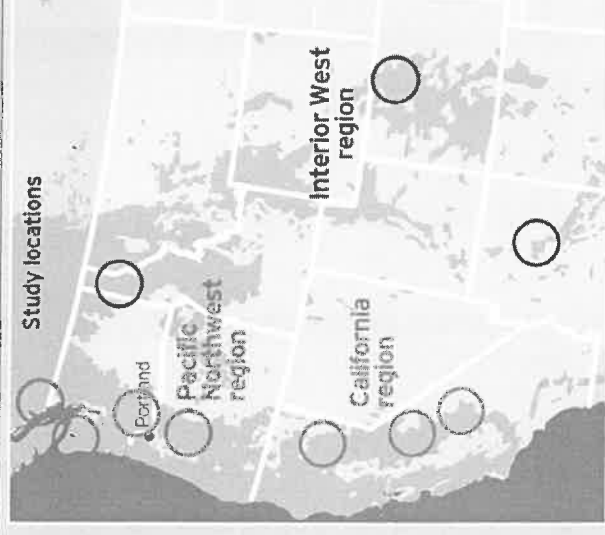
## Tree mortality increases

A team of researchers has concluded that death rates for conifer trees in old-growth forests are up across the West. The researchers used tree inventories from 76 undisturbed research plots and calculated the years it took for the tree death rate to double in three different regions:

	Mortality rate doubled in:
Pacific NW	17 yrs.
California	25 yrs.
Interior West	29 yrs.

Note: Colored circles represent tree inventory study locations in each region.

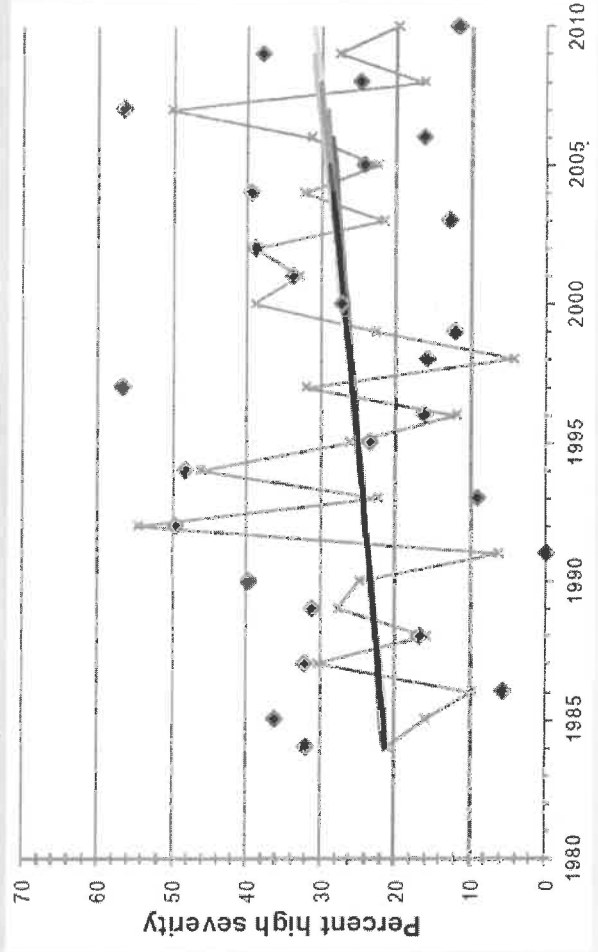
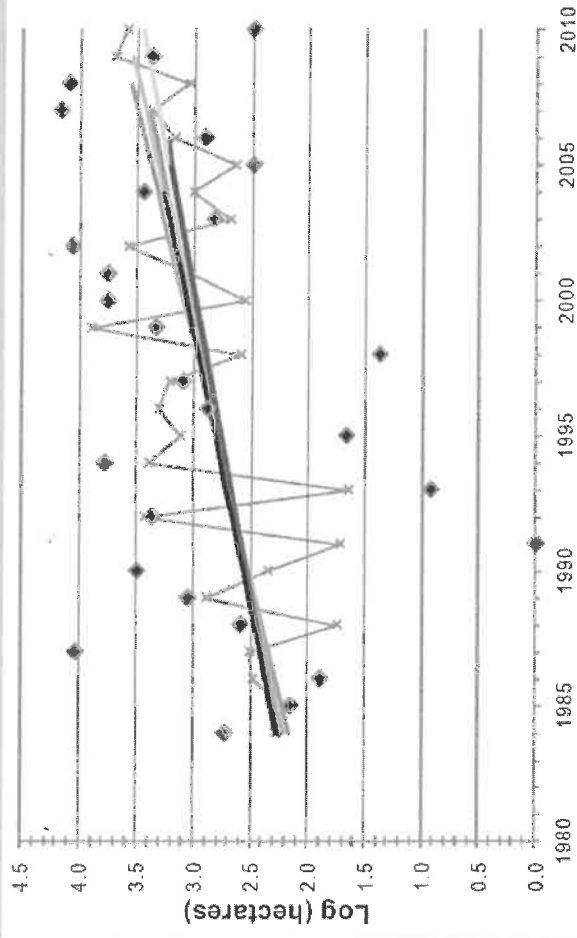
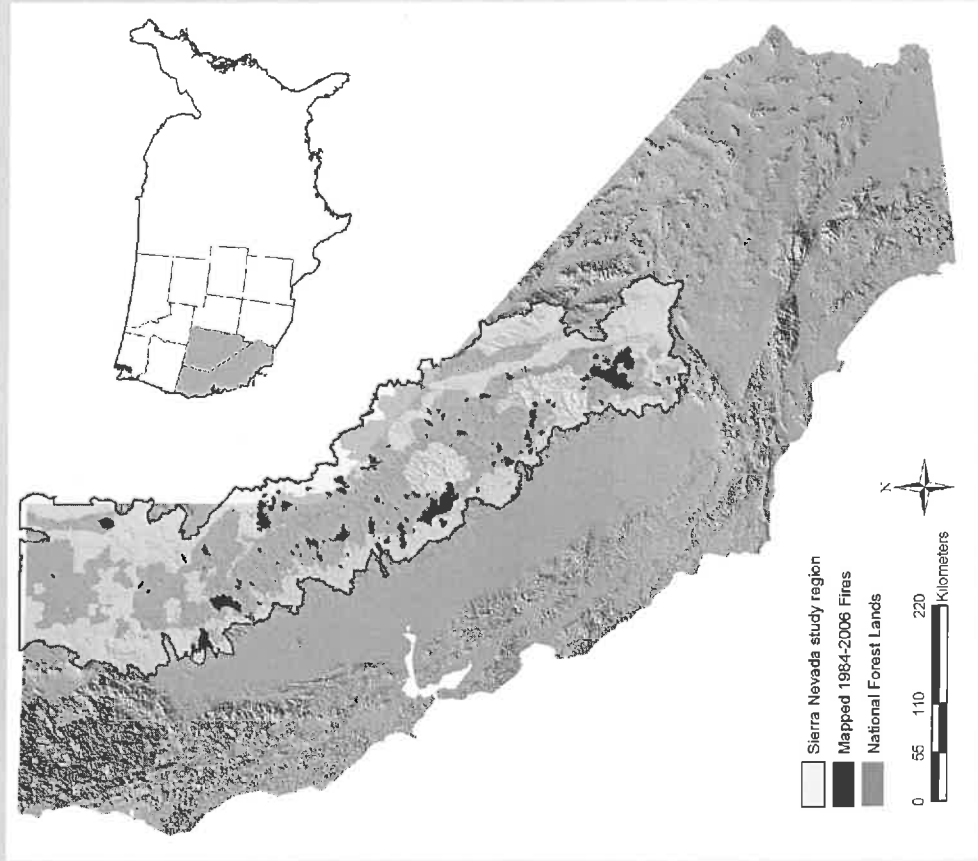
Source: "Widespread Increase of Tree Mortality Rates in the Western United States," a report by Philip J. van Mantgem and 10 co-authors



MICHAEL MOSE/THE OREGONIAN

- Increased tree density leads to drought stress
- Mortality disproportionately affecting LARGE TREES
- Likely to be exacerbated by climate change:
  - 1) greater annual weather variability; 2) higher evaporative demand; and 3) bark beetle populations

# Contemporary fire severity patterns on National Forests



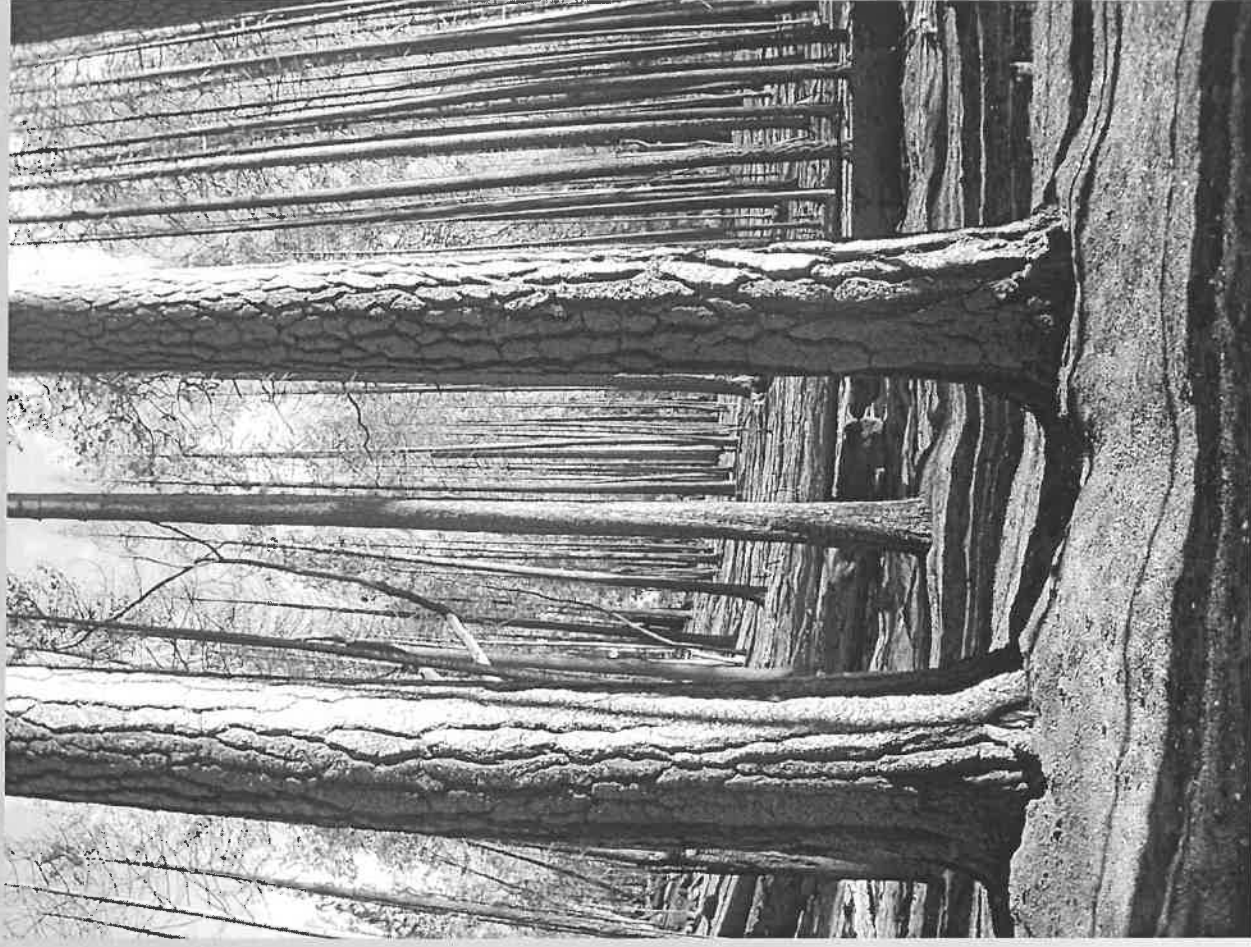
Miller and Safford 2012, Fire Ecology

# Field plot within Rim Fire (Stan. NF - 2013)

Pre-fire (15-Jul-2013)



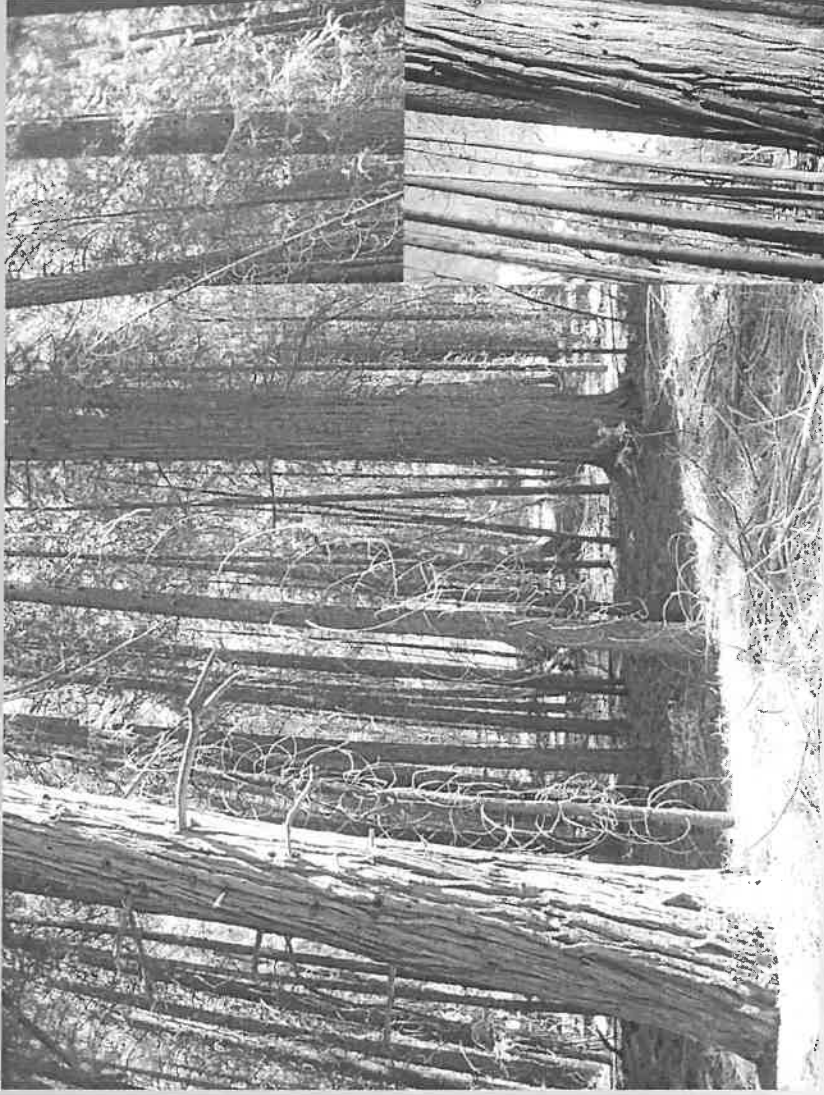
Post-fire (25-Sep-2013)



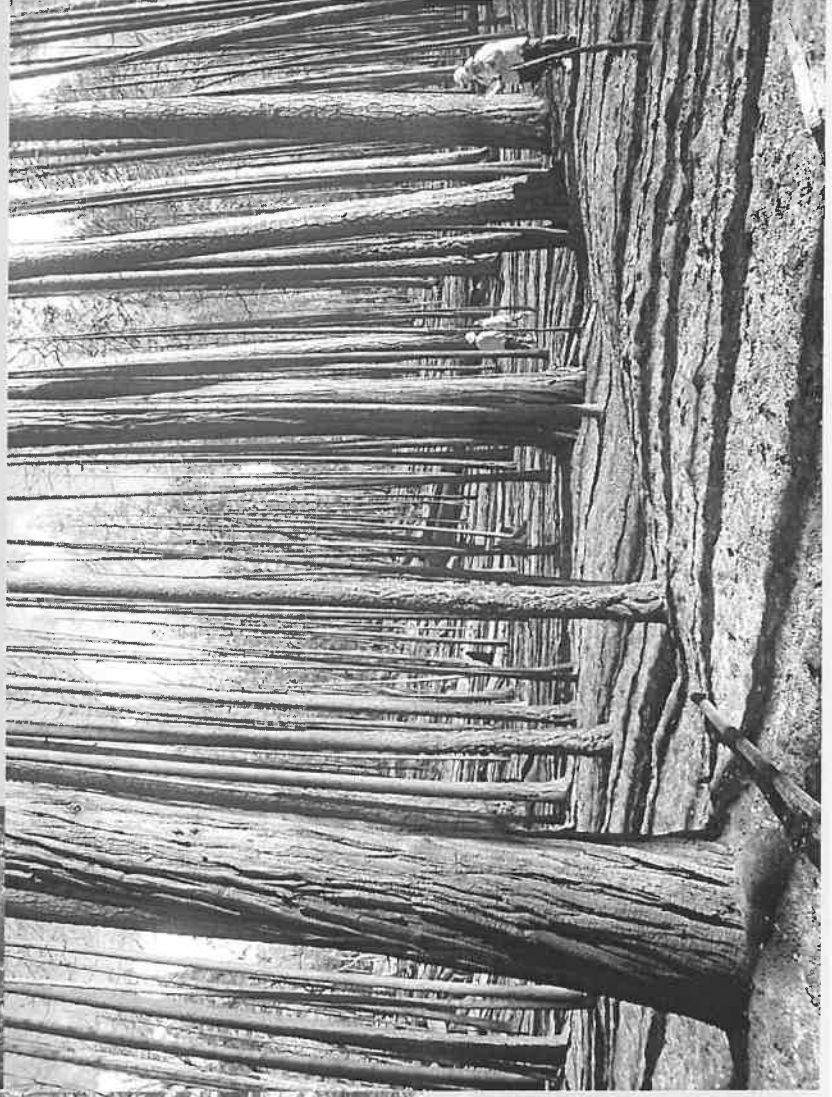


# Field plot within Rim Fire

**Pre-fire (15-Jul-2013)**



**Post-fire (25-Sep-2013)**



**Stand-replacing patch, Bucks Complex (1999)  
Plumas NF - Taken in 2010**



## 2. Factors driving fire patterns: Fire weather

### Days exceeding 90<sup>th</sup> percentile

