

FIRE INTENSITY LEVELS

Initial Summary [Rousopoulos 1975] used at National Fuel Management Workshop 1974.

Fireline intensity (Btu/s/ft)	Calculated flame length (Feet)	Fire descriptions and control actions
I:		
2-3	<1	Few fires exist at this low intensity. [Byram 1959]
II:		
19-58	2-3	Most prescribed fires backing into the wind in surface fuels. Depth of flaming zone <1 ft and flame length about 2 ft. [Brown and Davis 1973]
20-100	2-4	Prescribed backfires in slash-longleaf pine with palmetto-gallberry understory reduced surface fuels and did little damage to overstory. Higher intensities resulted in stand damage, especially with low winds, rates of spread between 1.5 and 3 ft/min. [Hough 1968]
24	2	Test fire in balsam fir understory with tree height of 13 ft and crown base height of 3 ft. Crown bulk density moderate to light at 0.0087 lb/ft ³ . Fire would not sustain crowning, only occasional torching. Ground fire below critical level. [Methven and Murray 1974]
27	2	Fire in surface fuels of eucalypt forest. Load of 3.4 t/a fuels <1/4 in.; rate of spread about 1.1 ft/min and flame length about 12 to 15 inches. [McArthur 1967]
100	4	In Eucalypt forests, generally represents limit of control for manual ground attack. Flames exceed 3 ft and rate of spread is about 4 ft/min. Is the maximum prescribed for controlled burning activities. [Hodgson 1968]
III:		
100-1000	4-11	Prescribed and wildfires burning with the wind in surface fuels. Most are controlled by direct attack with conventional firefighting methods, considered to be two-dimensional fires. At upper end of range, flames will be about 9 ft and heat from fire will be intense, 30-40 feet from fire. [Brown and Davis 1973]
112	4	Fire in surface fuels of eucalypt forest. Load of 6.5 t/a fuels <1/4 in. with rate of spread 2.4 ft/min. Flame length up to 5 feet but averaged 3-4 feet. [McArthur 1967]
210	5	Prescribed fire under sequoia-mixed conifer stand, three storied--white fir saplings (10 to 50 ft), ponderosa pine/incense cedar (100-180 ft), and sequoia (180 to 250 ft). Rate of spread of about 7.5 ft/min and combustion rate of 6367 Btu/min/ft ² . Live crown base moved up from 3 ft to 16 ft, live crown load reduced from 7.2 to 3.1 t/a. [Kilgore and Sando 1975]

F I R E I N T E N S I T Y L E V E L S (Continued, Page 2)

Fireline intensity (Btu/s/ft)	Calculated flame length (Feet)	Fire descriptions and control actions
Level III: (continued)		
500	8	Upper limit for good control; serious spotting limits attack; in eucalypt forest flames reach 8 feet high. [Hodgson 1968]
700	9	Limit for fires in ponderosa pine stands of R-3 that can be contained by initial attack forces. Used to set slash residue limits. [Jim Mann, R-3, Personal communications]
725	9	Test fires in red pine plantation of trees 46 ft high with crown base height of 23 ft. Crown bulk density was moderate--0.0162 lb/ft ³ . Crowning occurred for up to 2 minutes with flame lengths 20 to 23 feet long above crown. Dependent upon the ground fire. [Van Wagner 1968]
5200	23	
	Surface Crowning	
IV:		
>1000	11	Intensity above which spotting, torching, and crowning activities contribute significantly to fire spread and resistance to suppression.
1209	12	Test fire in Canadian black spruce stand 14 ft high with total load of about 15 t/a. About 54% of the crowns were burned, mainly by torching of clumps. Spotting was experienced up to 200 ft ahead of the front in a wind of 12 mi/h. [Kii1 1975]
1148- 1390	11 to 13	Test fires in jack pine stand 66 feet high with crown base of 39 feet. Crown bulk density is light at 0.0062 lb/ft ³ . No crowning occurred. [Van Wagner 1975]
2900	18	In stand with about 50% crown closure, fire achieved crowning but was dependent on ground fire. [Van Wagner 1975]
2000- 6500	15 to 26	Crown fires in standing pine observed with rates of spread from 35 to 90 ft/min. Flame lengths were observed to be 49 to 69 ft, exceeding about 26 ft above the tree canopy. [Van Wagner 1968]
10,500	32	1971 Thackary Fire in Ontario
13,500	36	1971 Whistle Lake Fire in Ontario. [Walker & Stocks 1972]
22,500	45	1967 Sundance Fire. Extensive crowning, long-range spotting, tree breakage and blowdown all occurred during the high-intensity portions of this fire. [Anderson 1968]
30,000	52	A major fast-spreading fire with flame depth to 1/4 mile or more and flame height from 50 to 150 feet. A change in fuels and/or weather is needed to suppress such a fire. [Brown and Davies 1973]

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