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Fuel Treatments and Fire Regimes

The JFSP, a partnership of six federal wildland fire and research organizations, provides scientific information and support for fuel and fire management programs.

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Background

The size and severity of recent fire episodes are widely attributed to altered fuel profiles as a result of fire exclusion and fire regime disruption in many ecosystems. Current national fuels management initiatives propose widespread application of prescribed fire and other treatments both to reduce the potential of catastrophic wildfire and to restore the structure and function of altered ecosystems.

This project sought to provide an assessment with a series of quantitative literature syntheses that focused on the following areas:

1) Geographic Variations in Historic Fire Regimes
2) Meta-analysis of 20th Century Changes to Historic Fire Regimes
3) Relating Historic Fire Regimes to 20th Century Fire Potential
4) Assessing Historic Fire Regimes as a Factor in Fuel Treatment Effectiveness

More than 450 publications were reviewed to obtain fire frequency information from 1710-1779 (see figure). The results of fire severity assessments in eight recent wildfires, sampled with standardized methods in adjacent treated and untreated stands, were synthesized. Sampled sites occurred in a variety of conifer forests throughout the Western U.S. and treatments included reduction of surface fuels and crown fuels, both in isolation and in combination. Study sites were restricted to wildfires that included adjacent treated and untreated areas within the perimeter and where treatment histories were documented and spatially explicit. Areas were avoided where significant barriers (e.g., cliffs, major roads or drainages) or suppression activities likely impeded fire spread, as well as areas where post-fire salvage activities had taken place or were imminent (see Table 7).

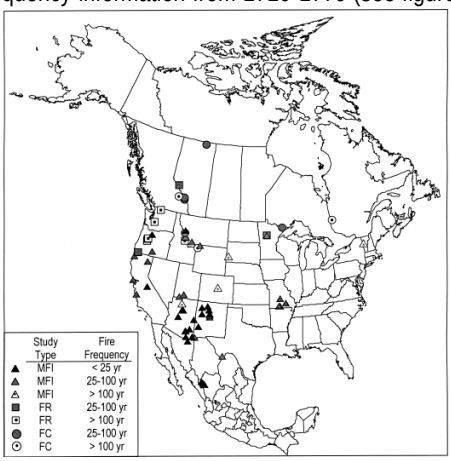

Table 7. Characteristics of the eight study sites included in the synthesis.

Site	Treatment Type	Treatment Age (yr)	Vegetation	Historic MFI[a]
'94 Webb fire, MT	Prescribed burn	4	Ponderosa	14
'94 Tyee fire, WA	Thin and burn	10	Ponderosa	22
'94 Cottonwood fire, CA	Thin, slash removed	4	Ponderosa	28
'96 Hochderffer fire, AZ	Thin and burn	1	Ponderosa	16
'99 Fountainebleau fire, MS	Prescribed burns	1	Slash pine	9
'99 Megram fire, CA	Pile and burn	2	Mixed conifer	59
'00 Cerro Grande fire, NM	Thin	1	Ponderosa	17
	Thin and burn	4	Ponderosa	17
'00 Hi Meadow fire, CO	Prescribed burn	1, 3, 5	Mixed conifer	52
	Thin	9	Mixed conifer	52

Notes:
[a] Historic mean fire interval (MFI) was estimated for each site from the nearest available fire history information.

Results and Discussion

Project results suggest that the best single predictor of fuel treatment effectiveness was mean residual tree diameter, followed by historic fire frequency. The most effective treatments are those that favor removal of small trees while leaving the largest and most fire resistant individuals. Also, treatments tend to be most effective where fire was historically most frequent. These trends suggest that the most appropriate fuel treatment applications will be those that are consistent with the objectives of restoring ecosystems to their historic structure and function.

Reversing the effect of fire exclusion in such locations through broad application of fuel treatments should allow fires to burn benignly under most conditions. However, in areas where fire was historically infrequent, climatic conditions are such that fuels are available for combustion only under the most extreme conditions. Fire exclusion has had little effect on fuel accumulation in these areas. Fuel treatments in these areas may reduce the total amount of fuel, but nonetheless increase fire hazard by promoting fine fuel desiccation via increased winds and solar radiation.

Thus, historic fire regimes should be a key consideration in fuel treatment applications. The fire frequency model produced by this project's synthesis of fire history studies may facilitate this. The fire frequency model quantifies geographic gradients in historic fire frequencies and can provide increased information for fire management objectives related to historic fire regimes, especially in areas where no fire history information currently exists. However, users of the model should recognize that it was developed from imperfect fire history reconstructions and that model predictions are merely approximate *average* fire frequencies. Model output should not be interpreted too literally, particularly when the predicted historic mean fire free period (MFFP) exceeds 100 years.

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You can obtain further information at
http://www.cnr.colostate.edu/frws/research/westfire/final%20report_FuelTT%20&%20fire%20regimes2.htm

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