FUEL MODELS

PART 2: National Fire Danger Rating System (NFDRS) Fuel Models

The following information was excerpted from: John E. Deeming, Robert E. Burgan, and Jack D. Cohen; "The National Fire-Danger Rating System—1978;" General Technical Report, INT-39; USDA Forest Service, Intermountain Forest and Range Experiment Station; Odgen, UT; 1977; 63 p.

The National Fire Danger Rating System - 1978 **Fuel Model Definitions**	
Fuel Model A	This fuel model represents western grasslands vegetated by annual grasses and forbs. Brush or trees may be present but are very sparse, occupying less than a third of the area. Examples of types where Fuel Model A should be used are cheat grass and medusa head. Open pinion-juniper, sagebrush-grass, and desert shrub associations may appropriately be assigned this fuel model if the woody plants meet the density criteria. The quantity and continuity of the ground fuels vary greatly with rainfall from year to year.
Fuel Model B	Mature, dense fields of brush 6 feet or more in height are represented by this fuel model. One-fourth or more of the aerial fuel in such stands is dead. Foliage burns readily. Model B fuels are potentially very dangerous, fostering intense fast-spreading fires. This model is for California mixed chaparral generally 30 years or older. The F model is more appropriate for pure chamise stands. The B model may be used for the New Jersey pine barrens.
Fuel Model C	Open pine stands typify Model C fuels. Perennial grasses and forbs are the primary ground fuel but there is enough needle litter and branchwood present to contribute significantly to the fuel loading. Some brush and shrubs may be present but they are of little consequence. Situations covered by Fuel Model C are open, longleaf, slash, ponderosa, Jeffrey, and sugar pine stands. Some pinion-juniper stands may qualify.
Fuel Model D	This fuel model is specifically for the palmetto-gallberry under story-pine over story association of the southeast coastal plains. It can be also used for the so-called "low pocosins" where Fuel Model O might be too severe. This model should only be used in the Southeast because of a high moisture of extinction.
Fuel Model E	Use this model after leaf fall for hardwood and mixed hardwood-conifer types where the hardwoods dominate. The fuel is primarily hardwood leaf litter. The oak-hickory types are best represented by Fuel Model E, but E is an acceptable choice for northern hardwoods and mixed forests of the Southeast. In high winds, the fire danger may be underrated because rolling and blowing leaves are not accounted for. In the summer after the trees have leafed out, Fuel Model E should be replaced by fuel Model R.
Fuel Model F	Fuel Model F is the only one of the 1972 NFDRS Fuel Models whose application has changed. Model F now represents mature closed chamise stands and oakbrush fields of Arizona, Utah, and Colorado. It also applies to young, closed stands and mature, open stands of California mixed chaparral. Open stands of pinion-juniper are represented; however, fire activity will be overrated at low wind speeds and where there are sparse ground fuels.

Fuel Model G	Fuel Model G is used for dense conifer stands where there is a heavy accumulation of litter and downed woody material. Such stands are typically over mature and may also be suffering insect, disease, wind, or ice damage -- natural events that create a very heavy buildup of dead material on the forest floor. The duff and litter are deep and much of the woody material is more than 3 inches in diameter. The undergrowth is variable, but shrubs are usually restricted to openings. Types meant to be represented by Fuel Model G are hemlock-Sitka spruce, Coast Douglas-fir, and wind thrown or bug-killed stands of lodge pole pine and spruce.
Fuel Model H	The short-needled conifers (white pines, spruces, larches, and firs) are represented by Fuel Model H. In contrast to Model G fuels, Fuel Model H describes a healthy stand with sparse undergrowth and a thin layer of ground fuels. Fires in H fuels are typically slow spreading and are dangerous only in scattered areas where the downed woody material is concentrated.
Fuel Model I	Fuel Model I was designed for clear-cut conifer slash where the total loading of materials less than 6 inches in diameter exceeds 25 tons/acre. After settling and the fines (needles and twigs) fall from the branches, Fuel Model I will overrate the fire potential. For lighter loadings of clear-cut conifer slash, use Fuel Model J, and for light thinnings and partial cuts where the slash is scattered under a residual over story, use Fuel Model K.
Fuel Model J	This model complements Fuel Model I. It is for clear-cuts and heavily thinned conifer stands where the total loading of materials less than 6 inches in diameter is less than 25 tons/acre. Again, as the slash ages, the fire potential will be overrated.
Fuel Model K	Slash fuels from light thinnings and partial cuts in conifer stands are represented by Fuel Model K. Typically the slash is scattered about under an open over story. This model applies to hardwood slash and to southern pine clear-cuts where the loading of all fuels is less than 15 tons/acre.
Fuel Model L	This fuel model is meant to represent western grasslands vegetated by perennial grasses. The principal species are coarser and loadings heavier than those in Model A fuels. Otherwise the situations are very similar; shrubs and trees occupy less than one-third of the area. The quantity of fuel in these areas is more stable from year to year. In sagebrush areas Fuel Model T may be more appropriate.
Fuel Model N	This fuel model was constructed specifically for the sawgrass prairies of south Florida. It may be useful in other marsh situations where the fuel is coarse and reed-like. This model assumes that one-third of the aerial portions of the plants are dead. Fast-spreading, intense fires can occur even over standing water.
Fuel Model O	The O fuel model applies to dense, brush-like fuels of the Southeast. O fuels, except for the deep litter layer, are almost entirely living in contrast to B fuels. The foliage burns readily except during the active growing season. The plants are typically over 6 feet tall and are often found under an open stand of pine. The pocosins of the Virginia, North and South Carolina coasts are the ideal of Fuel Model O. If the plants do not meet the 6-foot criteria in those areas, Fuel Model D should be used.
Fuel Model P	Closed, thrifty stands of long-needled southern pines are characteristic of P fuels. A 2- to 4-inch layer of lightly compacted needle litter is the primary fuel. Some small diameter branchwood is present but the density of the canopy precludes more than a scattering of shrubs and grass. Fuel Model P has the high moisture of extinction characteristic of the Southeast. The corresponding model for other long-needled pines is U.
Fuel Model Q	Upland Alaskan black spruce is represented by Fuel Model Q. The stands are dense but have frequent openings filled with usually inflammable shrub species. The forest floor is a deep layer of moss and lichens, but there is some needle litter and small-diameter

	branchwood. The branches are persistent on the trees, and ground fires easily reach into the tree crowns. This fuel model may be useful for jack pine stands in the Lake States. Ground fires are typically slow spreading, but a dangerous crowning potential exists. Users should be alert to such events and note those levels of SC and BI when crowning occurs.
Fuel Model R	This fuel model represents the hardwood areas after the canopies leaf out in the spring. It is provided as the off-season substitute for E. It should be used during the summer in all hardwood and mixed conifer-hardwood stands where more than half of the over story is deciduous.
Fuel Model S	Alaskan or alpine tundra on relatively well-drained sites is the S fuel. Grass and low shrubs are often present, but the principal fuel is a deep layer of lichens and moss. Fires in these fuels are not fast spreading or intense, but are difficult to extinguish.
Fuel Model T	The bothersome sagebrush-grass types of the Great Basin and the Intermountain West are characteristic of T fuels. The shrubs burn easily and are not dense enough to shade out grass and other herbaceous plants. the shrubs must occupy at lease one-third of the site or the A or L fuel models should be used. Fuel Model T might be used for immature scrub oak and desert shrub associations in the West, and the scrub oak-wire grass type in the Southeast.
Fuel Model U	Closed stands of western long-needled pines are covered by this model. The ground fuels are primarily litter and small branchwood. Grass and shrubs are precluded by the dense canopy but occur in the occasional natural opening. Fuel Model U should be used for ponderosa, Jeffrey, sugar pine, and red pine stands of the Lake States. Fuel Model P is the corresponding model for southern pine plantations.