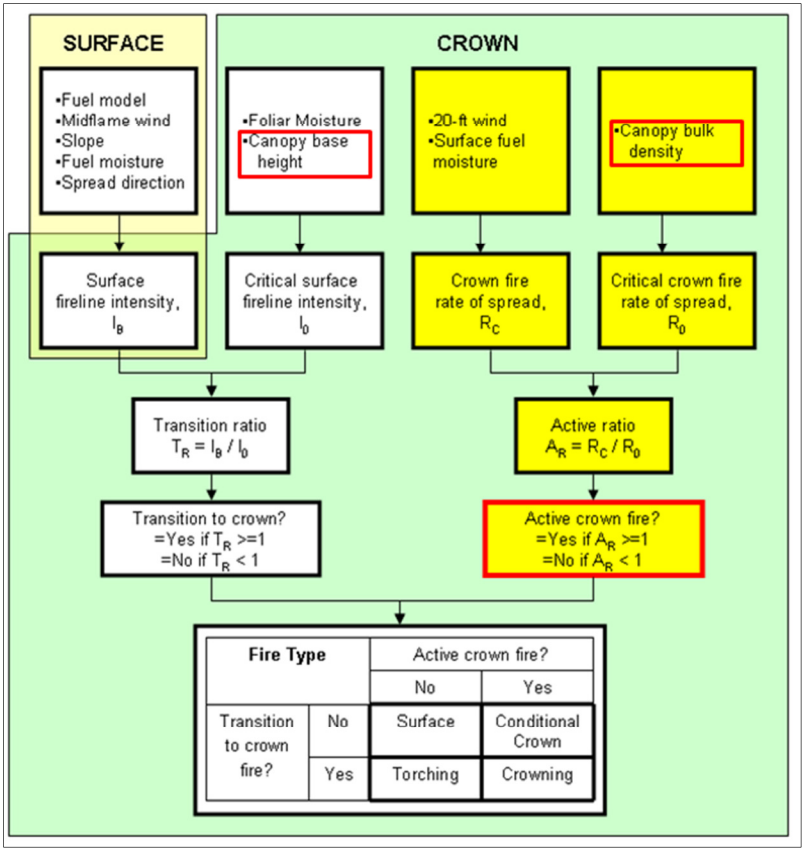
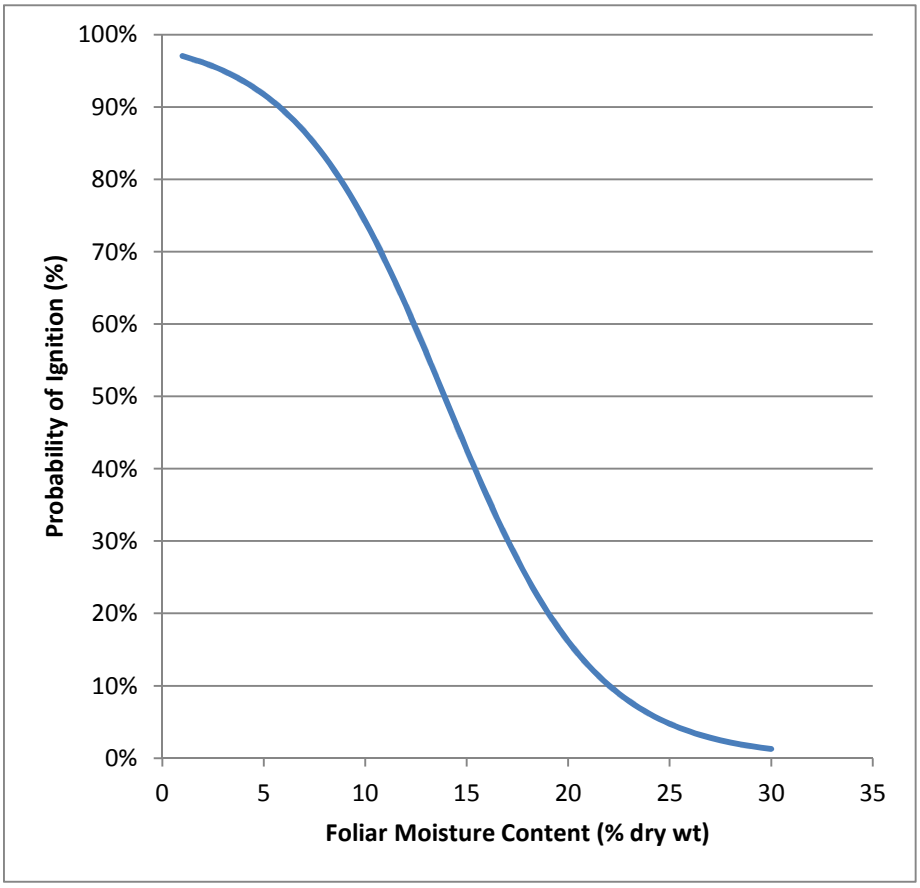
Modeling Adjustments for Bark Beetle Infested Stands



The critical surface fireline intensity needed to initiate passive crown fire in red stage canopy is much lower due to lower foliar moisture content and higher probability of ignition. Foliar moisture content is constant across the model landscape and cannot be varied to represent higher probability of ignition. Adjustments to canopy base height need to be made in areas with red stage canopy to compensate for lower foliar moisture content. The critical crown fire rate of spread needed to transition to active crown fire is also lower in red needle canopy due to lower foliar moisture content and in gray stage canopy do to the increased availability of dead branchwood fuels. Adjustments to canopy bulk density need to be made in areas of red stage and gray stage canopy to compensate for increased flammability of canopy fuels. Canopy cover also needs to be reduced in grey stage canopy to account for loss of needles.

Fuel Moisture (%)	*Probability of Ignition (%)*
1	97%
2	96%
3	95%
4	94%
5	92%
6	89%
7	87%
8	83%
9	79%
10	74%
11	69%
12	63%
13	56%
14	49%
15	43%
16	36%
17	30%
18	25%
19	20%
20	16%
21	13%
22	10%
23	8%
24	6%
25	5%
26	4%
27	3%
28	2%
29	2%
30	1%



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Using the default foliar moisture content of 100% as the reference foliar moisture content and multiplying canopy base height by the fractional values in the table below will simulate the associated corrected foliar moisture content values. The formula can be applied if the reference foliar moisture content is less than or greater than 100%.

Corrected Foliar Moisture Content (%)	CBH Correction Factor (assuming 100% reference FMC)
100	1.000
90	0.915
80	0.830
70	0.745
60	0.660
50	0.575
40	0.490
30	0.405
20	0.320
10	0.235

$$CBH_{effective} = CBH * \frac{1}{\left(\frac{460 + 26 * FMC_{Green}}{460 + 26 * FMC_{Red}}\right)}$$

FMC_{Green} – Reference Foliar Moisture Content (usually 100%)
FMC_{Red} – Corrected Foliar Moisture Content

Using hourly weather observations from a representative weather station the formula below can be used to calculate the Burn Period Index for each hour. By comparing the hourly index values to observed periods of fire spread and identifying a threshold value above which spread was observed, forecast values from the same station can then be used to estimate forecast burn periods. Other influences on fire spread should also be taken into consideration such as instability and shading from smoke and/or clouds.

$$\boldsymbol{Burn\ Period\ Index} = \frac{Dry\ Bulb\ Temperature}{Relative\ Humidity} * Windspeed$$

Links to geospatial data

Region 1 and Region 4 Aerial Detection Survey (ID, MT, ND, NV, SD, UT, WY)
http://www.fs.usda.gov/detail/r4/forest-grasslandhealth/?cid=stelprdb5366459
Region 2 Aerial Detection Survey (CO, NE, SD, WY)
http://www.fs.usda.gov/detail/r2/forest-grasslandhealth/?cid=fsbdev3_041629
Region 3 Aerial Detection Survey (AZ, NM)
http://www.fs.usda.gov/detail/r3/forest-grasslandhealth/insects-diseases/?cid=STELPRDB5228474
Region 5 Aerial Detection Survey (CA)
http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696
Region 6 Aerial Detection Survey (OR, WA)
http://www.fs.usda.gov/detail/r6/forest-grasslandhealth/insects-diseases/?cid=stelprd3791643
Forest Health Protection Mapping and Reporting (go to IDS Explorer)
http://foresthealth.fs.usda.gov/portal