

# Northern Rockies

## Fuels and Fire Behavior Advisory

August 14, 2012

**Subject:** Rapid transitions from surface fire to group torching and active crown fire behavior in mountain pine beetle killed lodgepole pine.

**Discussion:** Fire behavior in lodgepole pine that has been attacked and killed by the mountain pine beetle is showing rapid transition from surface fire to crown fires. There are now several instances where fire resources have been surprised by the change in fire behavior. In at least two situations personnel have had to rapidly disengage from the fire and retreat to safety zones.

The foliar moisture content in lodgepole pines that is in the green attacked or red stage can be much lower than surrounding green trees. This lowered FMC is contributing to very rapid fire behavior transitions with little to no warning. This transition has been observed when the relative humidity has dropped below 20% and dry bulb temperature is above 75°. Wind has not been a factor in this transition. Independent crown fire behavior can continue under these conditions without any surface fire below the tree. Embers landing in the canopy of beetle attacked or killed trees can ignite the foliage continuing the crown fire movement. (Visualize putting a lit cigarette in a brown Christmas tree and seeing the entire tree bursting into flames.)

### Concerns to Firefighters and the Public:

- Anticipate rapid transition of surface fire behavior to passive and active crown fire behavior when Temperatures are above 75°, Relative Humidity is below 20% and foliage is in sunlight.
- Wind is not needed to influence this fire behavior transition.
- Anticipate rapid fire growth in all directions as this is a fuels dominated condition.
- Anticipate long distance spotting in any direction.
- Anticipate independent crown fire movement that is perpetuated by embers landing in the foliage of beetle attacked or killed trees.

### Mitigation Measures:

- Closely monitor fire weather conditions to maintain Situational Awareness.
- Track the probability of ignition. Utilize the table developed by the Missoula Fire Lab for Mountain Pine Beetle attacked trees. Probability of Ignition above 70% should be an early trigger point in decision making. POI greater than 80% firefighters should be prepared for rapid transitions from surface to crown fire behavior.
- When initial attacking new fires in these conditions if possible delay engagement to after peak burning period or early morning when fire behavior is low.
- Escape routes and safety zones must be identified before engagement. Using the green as a safety zone should not be considered. Identify at least two different Escape Routes and Safety Zones in case your original ones are compromised.
- Monitor and understand the effect of weather changes and topography have on fire behavior.
- Post lookouts that can see the flaming front.

**Area of Concern:** The mountain pine beetle has impacted forests across the Rocky Mountains from above the Canadian border south into Colorado. In Region 1 primary areas of concern are: Helena, Beaverhead/Deerlodge, Lewis and Clark, Bitterroot, Lolo, Nez Perce/Clearwater and Gallatin National Forests. In Region 4 primary areas of concern are: Salmon/Challis, Bridger Teton, and Caribou/Targhee.

## Probability of Ignition in Mountain Pine Beetle Attacked Trees

### (Green Attacked and Red Needle Stages)

To find the probability of ignition follow the instructions found in the IRPG on pages 83 – 85. Determine the Reference Fuel Moisture (RFM) % and apply the appropriate adjustment factors to determine the Dead Fuel Moisture of pine needles at the fire location. Add the resulting Dead Fuel Moisture Content Correction (%) to the Reference Fuel Moisture (%), this is your Fuel Moisture (%). Apply this number to the MPB Attacked Tree Table to determine the Probability of Ignition for affected trees.

<i>Fuel Moisture (%)</i>	<i>Probability of Ignition (%)</i>
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%