



Forests for Tomorrow

Notes To THE FIELD

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AN ASSESSMENT OF TREE CONDITION AND WORKER SAFETY CONCERNS IN MOUNTAIN PINE BEETLE-KILLED AND FIRE-DAMAGED STANDS

Background

Standing dead and decaying trees contribute significantly to the structure and function of forest ecosystems and provide critical habitat for an abundance of wildlife species. At the same time, such standing deadwood poses a hazard to the safety of forest workers.

Given the current magnitude and intensity of the mountain pine beetle (*Dendroctonus ponderosae*) infestation in British Columbia – and the ever-present threat of wildfire in the province, concerns have been raised about whether the provincial WDTAC¹ procedures are rigorous enough to accurately assess tree condition and potential work hazards in stands affected by beetle infestation or fire.

In the fall of 2005, a study was undertaken to answer this question. Fifty-eight fixed-radius study plots were established in beetle-killed stands and fire-damaged stands in the Sub-Boreal Spruce zone in the central Interior. The results of this study are summarized here.

The project approach

- Thirty-six plots were established in beetle-killed lodgepole pine stands, stratified by time-since-death (0–3 yr, 3–5 yr, or 10⁺ yr) and site moisture (dry or mesic). Twenty-two were established in fire-damaged lodgepole pine stands, stratified by the same time-since-death categories and by fire intensity (medium or high intensity burn, as indicated by Build-up Index [BUI] values).

- In total, 536 individual tree assessments were conducted (321 in beetle-killed stands and 215 in fire-damaged stands).
- A subsample of 45 trees was destructively sampled (27 in beetle-killed stands and 18 in fire-damaged stands) to determine actual internal tree condition and stem shell thickness.

Definitions:

Build-up Index (BUI): A numerical rating of the total amount of fuel available for combustion in the sub-surface layer located between forest litter (non-decomposed vegetation and woody material) and mineral soil. The drying of this layer over time is represented by the BUI value. A high BUI value usually results in a “hot fire” that often severely damages the organic soil layer and tree root systems.

Level 3 disturbance: A category that describes a high level of ground or tree disturbance that might be caused by certain types of work activities (e.g., tree harvesting, use of heavy machinery).

Class 5 dead tree: A category of standing dead tree; a tree with few or no limbs and loose and missing bark.

Findings and conclusions

BEETLE-KILLED STANDS

Defects were observed on 35 beetle-killed trees (11% of the beetle-killed sample population). Stands on moist sites, regardless of time-since-death, consistently showed greater root system damage than did stands on dry sites. Root decay was the most common defect observed, and occurred in trees dead for at least 10 years.

¹ Wildlife/Danger Tree Assessor's Course

Both WDTAC visual assessment methods and destructive sampling showed that only seven of the beetle-killed trees (2% of the sample population) were dangerous. All of these trees were located on moist sites, all had been dead for more than 20 years, and all were rated dangerous because of root (or basal) condition failure.

It was concluded that:

- *beetle-killed lodgepole pine, especially on drier sites, can remain standing, posing minimal hazard, for at least 10–20 years after death; and*
- *the WDTAC process is effective for identifying danger trees and detecting changes in the extent of decay/deterioration in beetle-killed stands over time and between moist and dry sites.*

FIRE-DAMAGED STANDS

Defects were observed on 36 fire-damaged trees (17% of the fire sample population). Both WDTAC visual assessment methods and destructive sampling showed that only nine of the trees (4% of the sample population) were dangerous. All of these trees were located on high intensity wildfire sites ($BUI > 70$) and all had sustained severe root system and stem damage (Figure 1).



Photo: BC Ministry of Forests and Range, Protection Branch

It was concluded that:

- *fire-damaged lodgepole pine is more likely to be dangerous on high intensity burn sites ($BUI > 70$); and*
- *the WDTAC process is effective for identifying danger trees in fire-damaged stands.*

Recommendations for assessing tree condition and potential hazard

It is recommended that the WDTAC criteria and procedures for assessing danger trees continue to be used in beetle-killed and fire-damaged stands. The following recommendations provide additional guidance:

- *In beetle-killed stands:*
Before conducting general silviculture activities in beetle-killed stands **on dry sites**, follow the current WDTAC danger tree assessment standards.

In fire-damaged stands:
Before conducting general silviculture activities in beetle-killed stands **where trees have been dead for more than 15 years AND are located on moist or wet sites**, follow current WDTAC danger tree assessment standards. However, if wind speeds exceed 20 km/h, either cease work activities or reassess the site to Level 3 disturbance.
- *In fire-damaged stands:*
Before conducting any silviculture activities **on high intensity burn sites ($BUI > 70$)**, ensure that a qualified person has performed a thorough site assessment as part of the pre-work field inspection. That person should determine the general type and extent of fire damage to standing trees, including damage to the anchoring soil layer, degree of root burn, and burn damage at the tree base and to the lower portion of the tree stem.

Figure 1 Tree showing extensive basal tree burn damage typical of high intensity fires. Note complete loss of organic duff layer.

What should assessors look for?

When conducting danger tree field inspections in older beetle-killed stands and fire-damaged stands, assessors should focus on the bottom end of the tree: roots, ground level interface, and tree butt (see Figure 2). This is especially true for trees on high intensity wildfire sites and in beetle-killed stands that have been dead for more than 15 years and are located on moist or wetter sites.

Most standing dead trees from older beetle-killed stands belong to Class 5. Signs that a tree is a hazard are:

- Decay (rotting) or other damage to the tree stem at the tree-ground interface (see Figure 3).
- Severe damage to the main lateral roots (which may not even be present after a tree has been dead for more than 15 years).
- Significant lean ($15\%^+$) as a result of basal or root system damage.



Photo: Manning, Cooper and Associates Ltd.

Figure 2 Tree showing lean as well as extensive root and basal decay at the ground interface. Specimen has been dead for 23 years after mountain pine beetle attack and is located on a moist site.



Photo: Manning, Cooper and Associates Ltd.

Figure 3 Beetle-killed tree destructively sampled at ground level. Note extensive heartrot decay in the stem near ground level (time since death is approximately 20 years). Virtually no sound stemwood shell remains. The three areas outlined in black are the only sound sections of stemwood in the tree stem at this position.

For more information about wildlife trees, danger tree assessments, and related training programs in British Columbia, visit the Wildlife Tree Committee website: www.for.gov.bc.ca/hfp/values/wildlife/WLT/index.htm.

For further information about Forests for Tomorrow, visit www.for.gov.bc.ca/hfp/fft/ or contact John McClarnon, Forests for Tomorrow Officer (250-387-8903).

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