

Defoliation Free Growing Damage Standard for Determinate Growth Conifers 2005 03 02

The following Free Growing Damage Standard applies to determinate or fixed growth conifer species including true firs, spruces, pines, and Douglas-fir. Determinate growth conifers have internodes that represent annual growth. This standard does not apply to hemlocks and cedars that exhibit an indeterminate growth pattern. This standard is based on a comparison of the number of years of healthy needle retention, or healthy internodes, to an assumed healthy average of four years of needle retention. Determinate growth conifer species vary considerably in their ability to retain needles but for this standard, it is assumed that 4 years is the healthy benchmark.

The Free Growing Damage Standard for defoliation covers damage caused by both defoliating insects and foliar diseases. **For all insect defoliators and all but one foliar disease, the damage threshold is 20%, i.e. the damage threshold is 20% foliar retention.** Dothistroma¹ needle blight is the sole exception. Recent experience in northwest BC has shown that a 20% threshold for foliar retention is too low to define a **healthy** tree. The free growing damage criteria for Dothistroma in the ICH, CWH and SBS is 50% foliar retention. Based on current observations of Dothistroma dynamics, a foliar retention threshold of 50% represents a more realistic threshold at which there is a reasonable likelihood that the stand will remain in a free growing condition.

The pattern of defoliation varies widely among different damaging agents. For example, some foliar diseases attack only the current year's growth while others attack all foliage except the current growth. The procedure outlined below should guide surveyors to an appropriate call regardless of the pattern of damage.

The following three steps should be followed to estimate the extent of healthy foliage. If a tree contains **more than 20%** healthy foliage (more than 50% for Dothistroma) it is assumed that the tree has a good chance of maintaining its free-growing status if the foliar disease or defoliating insect event were to subside.

Step 1. Estimate the % live crown

Visualize a line perpendicular to the stem at the lowest point of the live crown. To be part of the live crown, a branch must have at least one green internode. This internode is one in which >50% of the needles in the internode are healthy. Estimate, to the nearest 10%, the extent of live crown. At age 10, healthy, well-spaced conifer trees should normally have green needles close to the ground or 100% live crown².

¹ Dothistroma needle blight symptoms include a scorched appearance with most damage occurring at the base of trees and progressing upwards. On individual needles bright red bands typically form at the interface between damaged and green foliage. Fruiting bodies often form within these red bands and consist of small black ball-like structures that cause small rips and raised flaps in the epidermis of dead needles.

² Natural crown lifting occurs in older and in densely stocked stands, in stands older than 10 years, a LIVE CROWN of $\geq 50\%$ = 100% for this survey methodology.

Step 2. Determine the % of healthy internodes

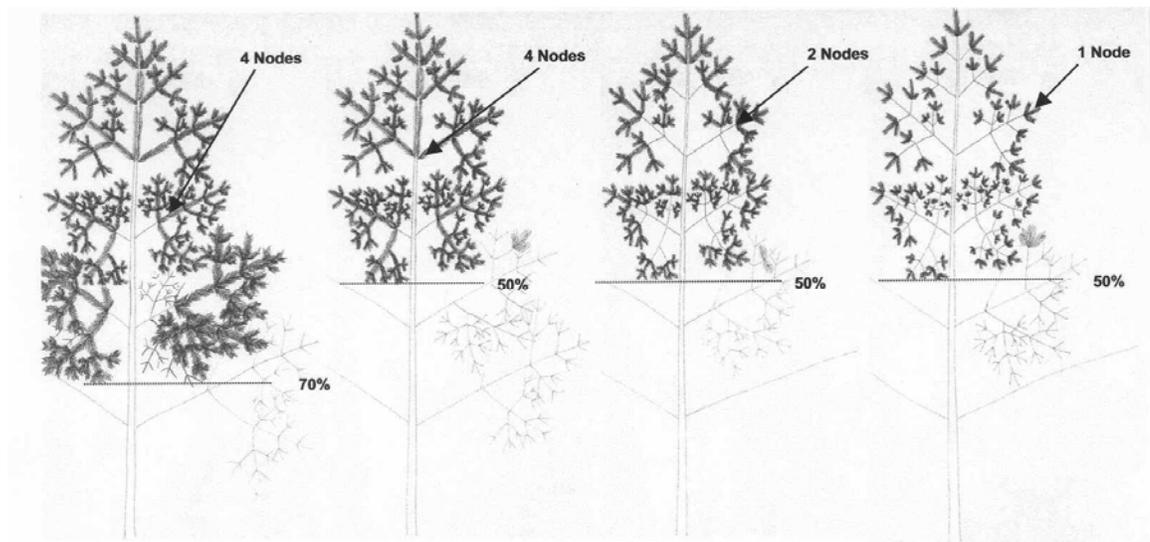
Normal, healthy conifers should retain a full needle complement for four years (i.e., 4 elongated internodes). If the foliar assessment is conducted prior to bud set (July 15), the current year's growth is not included. Surveys conducted after July 15th will include the current year's internode. For an internode to be rated as healthy, more than half of the needles in that internode must still be green.

Assess a representative branch from the midpoint of the live crown (as determined in Step 1). Determine how many of the four internodes have greater than 50% healthy needles. Determine the percentage of healthy internodes by dividing the number of observed healthy internodes by 4 and multiply by 100. In cases where the number of healthy internodes varies from branch to branch at a given whorl, choose a representative branch (i.e., do not attempt to pass (or fail) a tree by choosing an unrepresentative branch).

Step 3. Calculate the % of healthy foliage

Multiply the % live crown estimated in Step 1 by the % of healthy internodes determined in Step 2. The product is the extent of healthy foliation. If this value **exceeds 20%** the tree is free growing, provided it passes all of other free growing damage standard criteria. In the case of trees attacked by **Dothistroma** needle blight, this product must exceed **50%**.

Examples



a)
70% Live Crown
4/4 Healthy Nodes
 $70\% \times 100\%$
= 70%

b)
50% Live Crown
4/4 Healthy Nodes
 $50\% \times 100\%$
= 50%

c)
50% Live Crown
2/4 Healthy Nodes
 $50\% \times 50\%$
= 25%

d)
50% Live Crown
1/4 Healthy Nodes
 $50\% \times 25\%$
= 12.5%