Ministry of Forests, Lands,
Natural Resource Operations &
Rural Development

MEMO **DATE:** January 23, 2019

TO: Wildlife Dangerous Tree Assessors

FROM: Wildlife Dangerous Tree Committee of BC

TOPIC: Assessing Worksite Perimeters

The following guidance supports Wildlife Dangerous Tree (WLDT) Assessors when being asked to assess trees along worksite perimeter boundaries. The Forest Harvesting and Silviculture module of the Wildlife Dangerous Tree Assessor's Course (WDTAC) was revised as of January 2019 to clarify the process for managing worksite perimeter boundaries.

QUESTION: Along the worksite perimeter of forestry operations, how far into the forested perimeter does an assessor look for suspect trees, and upon what assessment criteria is the assessment based?

The Answer is Complex

The assessor needs to determine whether trees located outside of work site perimeters are posing a risk (exposure) to the workers within the work site. If workers stop performing LOD2 or LOD3 or LOD4 tasks at the work site boundary and all activities are directed to use a 'work away' from the boundary process, then there is diminishing risk from disturbance to trees the farther one looks beyond the perimeter into the standing forest. However, workers can still be exposed to trees beyond the immediate perimeter which can fail and land into the work site. The critical factor is to know what dangerous tree (hazard) criteria one must use to assess these 'outside the worksite' trees. The following guidance is provided in the WDTAC Forest Harvesting & Silviculture module for assessing suspect trees along work site perimeters. The relevant portions of the 2019 course manual are appended for reference.

Recommended Guidance for Work Site Perimeters

1. **Assessors must consider all suspect trees located within 1.5 tree lengths of a work site.**

- Trees are known to collapse and fall within the forest without any disturbance, and therefore, if such trees exist in the forest AND they are able to reach the work site, they need to be identified and assessed for risk of exposure to the workers.
- In the WDTAC it is taught that the NWZ can be adjusted larger or smaller, depending upon site factors such as slope, screening and lean. The diligent assessor must use this logic to ascertain whether a tree having significant hazards has a sufficient buffer of trees to prevent the tree from reaching the work site.
- If there is sufficient screening to prevent the fall of a tree or its part from reaching the work site, then the tree is not a risk to workers.
- Where there are steep slopes above the cutblock (>30%, as per Course Workbook) the LOD-1 assessment area must be extended upslope of the block. The distance extended would depend upon site factors (e.g., slope, terrain complexity, tree size, stocking, crown structure, lean, etc) to detect trees with an imminent risk of failure that could fail and slide downslope into the treatment zone (LOD2, 3, or 4) from around the cutblock (working area).

2. **Assessors must stratify the work site into two assessment zones, the treatment zone (the active work site) and the perimeter zone (the area surrounding the treatment area). See figure 1.**

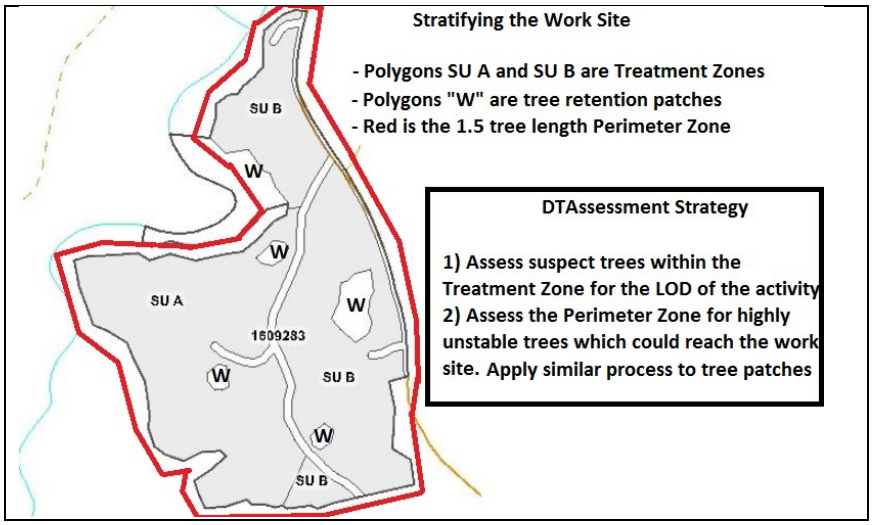

Figure 1: Example of stratifying a work site to define the scope of the DT assessment.

3. **The Treatment Zone consists of the active work site and the first 5 meters of the treatment area's boundary.**

- Trees along the immediate edge are exposed to wind. Their shifting in the wind will also affect neighbouring trees growing within their critical root zone. A ground vibration study revealed that damaging levels of vibration did not occur beyond 5m from the source of disturbance. Therefore, an assessor will use a 5m rule (or dripline crown length) along the workplace edge to capture trees likely to be disturbed during the activity.
- Assessors will assess suspect trees located within the active work site and within 5m of the work site according to the dangerous tree criteria for the LOD of the activity being undertaken.
- The active treatment area for cable logging blocks must be extended out to all guy-line anchors, tail-hold anchors, back spar trees and tieback stumps/trees. Because of the forces/vibration exerted on those anchors, stumps and trees, they should be considered as LOD-3 for cable yarding. This would then cover hook-tenders or other rigging crew who may be working near active anchors (e.g., prepping the next road change, etc).

4. **The perimeter zone consists of the 1.5 tree lengths of area surrounding the active treatment zone.**

- Assessors will search for suspect trees which may fall from the perimeter forest into the work site. The WDTAC instructs assessors that trees which are in a state of imminent collapse are deemed to be a significant hazard. The criteria used to identify dangerous trees within the perimeter zones would be the same criteria used to assess activities rated as having a low level of disturbance (LOD1).
- Trees which are identified to have significant hazards will need to be assessed to determine whether the tree or part can physically reach the worksite. If they will not reach the worksite, they are not to be deemed dangerous.

Application
The experienced assessor must apply their knowledge, skills and experience when determining how to assess work site perimeters. Within the perimeter zone the assessor will be searching for trees which are at risk of imminent collapse and likely to reach the worksite. This is the same criteria used for the dangerous tree criteria of LOD1 activities. The exception would be if workers are entering the forested perimeters to perform other work activities at higher than LOD1.

Trees within the Perimeter Zone need to be viewed from the perspectives of:
1) Is the tree (or its part) within reach of the work site, and
2) Is it likely the tree could collapse without any disturbance?

If the answer to BOTH these two conditions is YES, then the tree is a dangerous tree and needs to be managed accordingly.

If the assessor identifies suspect trees (see photo 1) that are within the Perimeter Zone, it is incumbent upon the assessor to review the trees amidst their surroundings and determine whether the trees pose an imminent hazard, and whether the hazardous portion of the tree can reach the work site.

PHOTO 1: Example of two suspect trees visible from a work site. While both trees **look bad** (they both have defects which are at high risk of collapsing), they are **not** declared dangerous **IF** the hazardous **parts** are not able to physically reach the work site. Consequently, they can be safely retained – the acceptable conclusion of a proper risk assessment.

SUMMARY

Assessors must review suspect trees located within both the treatment zone and the perimeter zone surrounding the worksite. The Assessor must then communicate to crews the safe work procedures they developed to ensure trees are not disturbed.

Within the active work site, all suspect trees must be proven safe if they are to be retained. If resource trees (e.g., CMT's, monumental trees, trees with active nests/den) are required to be retained within or alongside a work site, then these trees must also be assessed for hazards using the LOD of the work activities being performed, and workers instructed not to disturb these trees.

Work site perimeters must be assessed for hazards and the assessment process documented and communicated to subsequent workers. Suspect trees located immediately along the boundary will be assessed to the corresponding LOD of the activities within the work site. Moving into the forest and away from the work site perimeter, assessors must continue to look for trees that could collapse and fall into the work site. However, the criteria used to assess suspect trees away from the perimeter should be those criteria used for LOD1 activities, namely, trees which are at imminent risk of failure.

APPENDIX 1

Excerpts from the January 2019 edition of the

Wildlife/Dangerous Tree Assessment Course,
Forest Harvesting and Silviculture Module

WHAT IS A DANGEROUS TREE?

In the past, the term "snag" has been synonymous with "danger" and was historically defined in forestry operations as *a standing dead or dying tree over 3 metres in height.* However, not all snags are dangerous and live trees often have defects that are hazardous to workers. Consequently, the term "snag" has been replaced with "dangerous tree" in OHS Regulations part 26.1.

The following definition of "dangerous tree" now applies:

A DANGEROUS TREE...

… means a tree (live or dead, regardless of size) that is a hazard to a worker due to:

(a) its location or lean,

(b) its physical damage,

(c) overhead conditions,

(d) deterioration of its limbs, stem or root system, or

(e) any combination of the conditions in paragraphs (a) to (d).

With reference to dangerous trees and the work place, OHS Regulation 26.11 (1) (see also Appendix 4) states: *If it is known or reasonably foreseeable that work will **expose** a worker to a dangerous tree, (a) the tree must be removed or (b) a risk assessment of the tree must be undertaken.*

The procedures for determining whether a tree is dangerous to workers under various levels of disturbance, and the appropriate steps and safety procedures for avoiding the hazard, are described in the following sections.

DETERMINING TREE DANGER RATING

There are **5 steps** required to determine tree danger rating:

1. **Determine the level of ground disturbance** (refer to Tables 1, 1A)
2. **Conduct a site assessment overview** (refer to Table 2)
3. **Conduct tree assessments** (refer to Tables 3, 4, 4A and 5)
4. **Make the appropriate safety decision** (Safe or Dangerous)
5. **Provide documentation and communicate safety procedures**

This 5-step process is described in the sections that follow. Persons interested in dangerous tree assessment must understand that the processes described herein must be combined with field training and diligent practice.

Note**: Suspect trees within reach of forestry operations must be diligently managed by applying the full WDTAC process, and that means ALL the steps.**

STEP 1: Determine Level of Disturbance and Type of Activity

Level of Disturbance (LOD)

Various work activities are associated with differing levels of disturbance (LOD). Activities rated as low disturbance create minimal ground or tree disturbance and as a result, expose workers to very little danger. However, as the level of disturbance increases so does the potential danger. As a result, fewer activities are appropriate around potentially dangerous trees under situations of high ground or tree disturbance (e.g., helicopter logging), or where exposure to people and facilities is of long or constant duration (e.g., office buildings).

Table 1 relates level of disturbance (1 – 4 = "low, medium, high, very high") with various work activities. Table 1A describes wind speed disturbance equivalencies.

Very low risk (VLR) activities

Some activities result in **negligible levels of ground or tree disturbance and have low exposure time** to potential tree hazards. Consequently, the risk of injury due to tree hazards is very low. For the most part these are field reconnaissance activities that involve foot travel and survey or layout work, or travel on roads and trails with light vehicles (pickups, ATVs) to work areas. Very low risk activities include:

- forest surveys
- stand reconnaissance
- tree marking
- road and cutblock engineering and layout
- general light vehicle travel (pickups, ATVs)
- foot travel (walking, hiking, horseback riding).

For these situations, workers should keep a "heads-up" awareness of their surroundings and stay away from any obvious overhead tree hazards (e.g., insecurely lodged trees; hanging tops or limbs), and observe standard operating procedures for weather-related work shutdown (e.g., wind speed, fog, snow, rainfall).

For further details about significant tree hazards, see Table 3.

NO pre-work site inspection is required for the very low risk activities listed above

Table 1. Levels of disturbance for unprotected workers in various work activities

Level of Disturbance*	Example Types of Work Activities	Wind Speed Equivalency (km/h)
VLR (No assessment Required)	• forest surveys, stand recce, tree marking, road & cutblock layout, foot travel • general light vehicle travel (pickups, ATV's)	N/A
1 (Table 3)	• tree planting • brushing • tree pruning (stems <20 cm dbh) • use of light-duty machinery (e.g., weed whips, brush saws) • road travel with heavy vehicles (>5500 kg GVWR) on a constructed and maintained resource road • fire control with hand tools and/or water hoses	<40
2 (Table 4)	• road travel with heavy vehicles (>5500 kg GVWR) on a trail or overgrown road • maintenance or construction activities without heavy equipment (e.g., small machines such as "bobcats") • tree pruning (stems >20 cm dbh) • juvenile spacing or slashing (stems <15 cm dbh) • tree bucking	
3** (Table 4A)	• tree falling (any tree >15 cm dbh) • cable yarding • ground skidding • mechanical harvesting and forwarding • helicopter logging with NO workers exposed to rotor wash • use of light and intermediate helicopters where workers are exposed to rotor wash (e.g., helipads) • mechanical site preparation with heavy machinery • maintenance or construction activities with heavy equipment	40–65
4 (Table 5)	• trees adjacent to corridors in partial-cut cable logging operations • harvesting operations in structurally damaged stands (e.g., wildfire burns) • blasting • helicopter logging with workers exposed to rotor wash • use of medium and heavy helicopters where workers are exposed to rotor wash	+65

* A dangerous tree assessment is only valid for the lowest level of disturbance at which the assessment has been done.

** If trees CANNOT be safely felled and yarded away from adjacent standing timber (i.e., there is a chance that felled or yarded timber will strike adjacent standing "leave timber"), then default to Level 4 disturbance.

Table 1A should be used to determine Level of Disturbance Windspeed Equivalency. This is most useful when there is a need to "bump-up" the LOD rating to a higher value in order to allow work to continue under increasing wind conditions. For example, where an assessment has been conducted for level of disturbance 1 or 2, constant winds or frequent gusts (as opposed to infrequent gusts) that exceed 40 km/h during the work activity render the initial assessment invalid. Table 1B is a useful guide to the types of helicopters and their lift capacity ratings.

Therefore, in order to work under higher wind conditions, either stop work or reassess the potentially dangerous trees to an appropriate higher level of disturbance (e.g., LOD 3 = 40-65 km/h windspeed).

In addition, trees can initially be assessed at a higher level of disturbance in order to compensate for expected higher winds during the period of work activity, or because the work activity itself may change (e.g., cable logging level 3 becomes heavy lift helicopter with chokerman level 4).

Table 1A. Influence of wind speed on level of disturbance

Wind Speed (km/h)	Description	Level of Disturbance Equivalency
0–40	**light breeze** (dust and loose paper raised; small branches move) to **fresh breeze** (small trees sway; tops of large trees sway)	1–2
40–65	**strong breeze** (small branches fly in the air; whole tree in motion; resistance felt when walking against wind)	3
65+	**gale** (branches broken off trees; walking impeded)	4

Table 1B. Helicopter types

Helicopter Category	***Passenger Capacity***	***Lift Capacity***
Type 1 (Heavy)	*15+*	*Exceeds 2720kg (6000 lbs)*
Type 2 (Medium)	*9 – 14*	*1135 – 2720kg (2500-6000 lbs)*
Type 3 (intermediate)	*5 - 8*	*680 – 1134kg (1500 – 2500 lbs)*
Type 4 (Light)	*1 - 4*	*Not exceeding 680kg (1500 lbs)*

The following listing provides examples of common aircraft by helicopter type, and is a useful guide when determining the appropriate level of disturbance for the type of aircraft being used.

Light Category: Jet Ranger (Bell 206), Hughes 500, Hiller 12, EC 120, R22 & R44
Intermediate Category: Long Ranger, A-Star (AS350), Bell 407, EC 130
Medium Category: K-Max, Bell 204, 212, 205
Heavy Category: Bell 214, Kamov, Sikorsky 61 & 64, BV 107 & 234

STEP 2: Conduct Site Assessment Overview

Prior to going out to the field, review all available information relevant to the site (e.g., recent air photos, forest cover and terrain maps, silviculture prescriptions, site plans, and stand management prescriptions, etc.). Review the management objectives for the site.

How to use this table: The following site/stand factors should be reviewed during a walkthrough of the site, prior to individual tree inspection. The site overview provides a context for inspection of individual trees (i.e. it will identify overall site problems such as damaged stands or root rot). **Information and site/stand factors found in the site overview can provide useful clues as to the condition and potential danger of individual trees.** Consider using the sample field card in Appendix 6 for documenting the planning and risk assessment process in accordance with OHS Regulation 26.2.

Table 2. Site Assessment Overview (for all tree species)

Site/Stand Factors	Hazard Indicators/Influences
Stand history and condition	• evidence of past tree failure • disturbance history (natural or human-caused, including wildfire damage; age, condition and location of mechanically harvested "stubs") • general age, condition and density • tree species composition • evidence of root and/or stem diseases
Common rain, snow and ice conditions	• high snow or ice loading • high rain fall periods
Flooding	• high water table • evidence of water damaged/decayed roots • area prone to flooding
Windthrow potential	• topography • prevailing winds • evidence of significant windthrow • area of high or recent exposure • stems with height/diameter ratio >100 (i.e., very tall, slender stems) • saturated soils • shallow soils • restricted rooting depth • fine textured soils
Crown condition	• stress cone crop • thinning foliage and/or chlorosis • rounded crown • small live crown (<20% of tree height)
Resinosis	• higher than normal stem or basal pitch flow
Tree lean	• trees recently leaning due to windstorm, root damage, shifting root mat or other causes
Additional site-specific factors	• based on local knowledge (e.g., soil or slope instability)

Assessors must identify the critical site factors that will guide individual tree assessment. Information and observations made during the site assessment overview should be documented, especially when using this information to modify safety procedures or to assign a LOD to different treatment units (strata) at the worksite. For example, a plan to clear brush using brush saws during a fuel modification treatment (LOD1) might actually need to be considered similar to slashing (LOD2) if the vegetation being treated is tall and dense, preventing clear and unobstructed views of a worker's surroundings.

Assessors must also perform a risk assessment in relation to the season of work and consider the relationship of critical site factors. If treatments will be performed during a time where otherwise healthy, defect-free trees are prone to wind-induced failure (i.e., when shallow soils are wet) then consideration must be given to restricting work during high risk weather patterns (e.g., saturated soils and strong winds) or by creating wind speed shutdown criteria for the high risk strata. If a higher level of care is required then assessors must develop a safety plan that will provide control of the work site hazards – both known and foreseeable.

Therefore, steps 1 and 2 are a planning process that ensures assessors have considered all known or foreseeable worksite hazards prior to evaluating individual trees. This process will be used in step 5 to create a site safety plan that will control exposure to these hazards.

Assessing Work Site Perimeters

As part of the Site Assessment Overview process, the assessor must also determine where treatments will occur. The assessor needs to determine whether trees outside of work site perimeters are posing a risk (exposure) to the workers within the work site. If workers stop performing tasks at the work site boundary and all workers are directed to use a 'work away' from the boundary process, then there is a diminishing risk from disturbance to trees the farther one looks beyond the perimeter of the standing forest. However, workers can still be exposed to trees beyond the immediate perimeter which can fail and land into the work site.

Work site perimeters must be assessed for hazards, and the assessment process documented and communicated to subsequent workers. Suspect trees immediately along the boundary should be assessed to the corresponding LOD of the activities within the work site. Moving into the forest and away from the work site perimeter, assessors must continue to look for trees that could collapse and fall into the work site. However, the criteria used to assess suspect trees away from the perimeter are those used for LOD1, namely, looking for trees which are at imminent risk of failure.

Within the active work site, all suspect trees must be regarded as dangerous until proven safe if they are to be retained. If resource trees (e.g., culturally significant trees, rare and endangered trees, high value wildlife habitat trees) are required to be retained within or alongside a work site, then the tree must be assessed for hazards according to the LOD of the work site activity, and workers instructed not to disturb these trees.

Assessors must stratify their work site into two assessment zones (figure 5), the treatment zone (the active work site) and the perimeter zone (the area surrounding the treatment area). Assessors need to make their assessment of both the treatment zone and the perimeter zone, and then communicate the safe work procedures to ensure trees are not disturbed during worker activities.

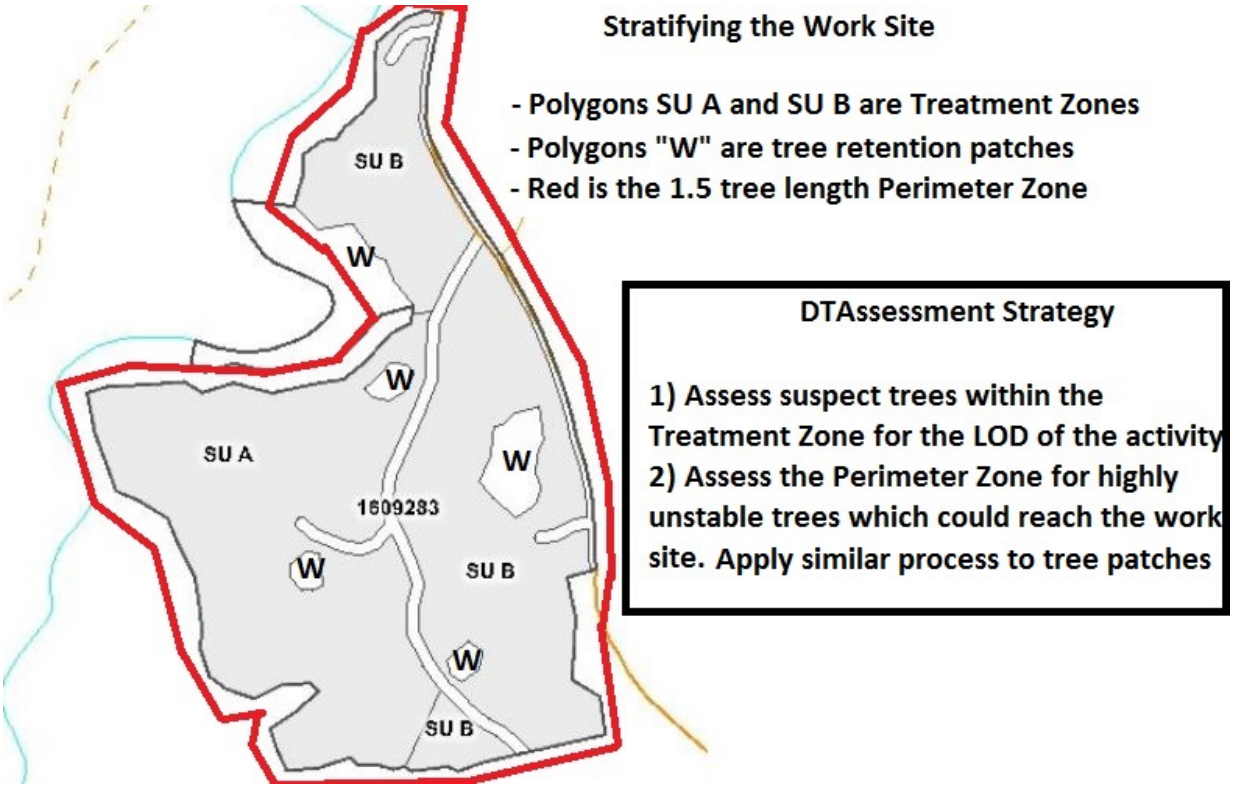

Figure 5: Example of a worksite stratified into tree assessment zones

The **Treatment Zone** consists of the active work site and the first 5 meters of the treatment area's boundary. The assessor will assess suspect trees located within the active work site and within 5m of the work site perimeter according to the dangerous tree criteria for the LOD of the activity being undertaken.

NOTE: The treatment zone for cable logging blocks must be extended out to all guy-line anchors, tail-hold anchors, back spar trees and tieback stumps/trees. Because of the forces/vibration exerted on those anchors, stumps and trees, they should be considered as LOD-3 for cable yarding. This would then cover hook-tenders or other rigging crew who may be working near active anchors (e.g., prepping the next road change, etc).

The **Perimeter Zone** consists of the 1.5 tree lengths of area surrounding the active treatment zone.

The experienced assessor must apply their knowledge, skills and experience when determining how to assess work site perimeters. The criteria for defining a dangerous tree within the perimeter zone of a work site (but out of reach from direct disturbance by the activity), will be to find trees which are at risk of imminent collapse as for the dangerous tree criteria of LOD1. The exception would be if workers are entering the forested perimeters to perform other work activities.

Trees within the Perimeter Zone need to be viewed from the perspectives of:

1) Is the tree (or its part) within reach of the work site, and
2) Is it likely the tree could collapse without any disturbance?

If the answer to BOTH of these two conditions is YES, then the tree is a dangerous tree and it needs to be managed accordingly.

If the assessor identifies a suspect tree that is within the Perimeter Zone, the assessor must review the tree amidst its surroundings and determine whether the tree poses an imminent hazard and whether the tree can reach the work site. The diligent assessor must consider whether a tree having significant hazards has a sufficient buffer of trees to prevent the tree from reaching the work site. If there is sufficient screening to prevent the fall of a tree or its part from reaching the work site, then the tree is not a risk to workers.

Where there are steep slopes above the cutblock (e.g., >30%) the assessment of the perimeter area must be extended upslope of the treatment zone. The distance extended would depend upon site factors (e.g., slope, terrain complexity, tree size, stocking, crown structure, lean, etc) to detect trees with an imminent risk of failure that could fail and slide downslope into the treatment zone.

Assessors need to make their assessment of both the treatment zone and the perimeter zone, and then communicate the safe work procedures to ensure trees are not disturbed during worker activities.

STEP 3: Conduct Tree Assessment

Visual Tree Inspection

The determination of tree safety/danger is generally a visual process. Careful observation of tree defects can generally result in determination of an individual tree's failure potential and resultant safety decision within several minutes. However, where visual inspection identifies questionable root stability or shell thickness and where the results of the visual inspection are inconclusive, a detailed assessment involving root probing and/or stem sampling will be necessary.