

Hardwood Tree Grading Field Guide



***Nova Scotia Department of
Natural Resources***



***Nova Scotia Department of Natural Resources
Forest Inventory Division
Truro, Nova Scotia
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Introduction

This field guide consists of four sections. The initial assessment, tree grading, scale defects and grade defects.

The first section, initial assessment, will guide the cruiser through the steps necessary to determine if a hardwood tree qualifies as a sawlog tree.

The second section, hardwood tree grading describes how to grade those trees which qualify as hardwood sawlog trees.

The third section, scale defects, measurement and identification, gives detailed information on how to identify and measure the various scale defects found on hardwood sawlog trees.

The fourth and final section, clear cuttings, will enable the cruiser to identify the various grade defects found on the hardwood sawlog trees and determine how they affect the length of clear cuttings on the grading face of the tree.

Charles Harrington
September, 2005

SECTION ONE

INITIAL ASSESSMENT

- ***Species identification***
- ***Tree status***
- ***Diameter at breast height***
- ***Establish stump height***
- ***Too short (hardwood)***
- ***Excessive lean***
- ***Excessive rot***
- ***Severe sweep***
- ***Excessive grade defects***



Valid Hardwood Sawlog Species

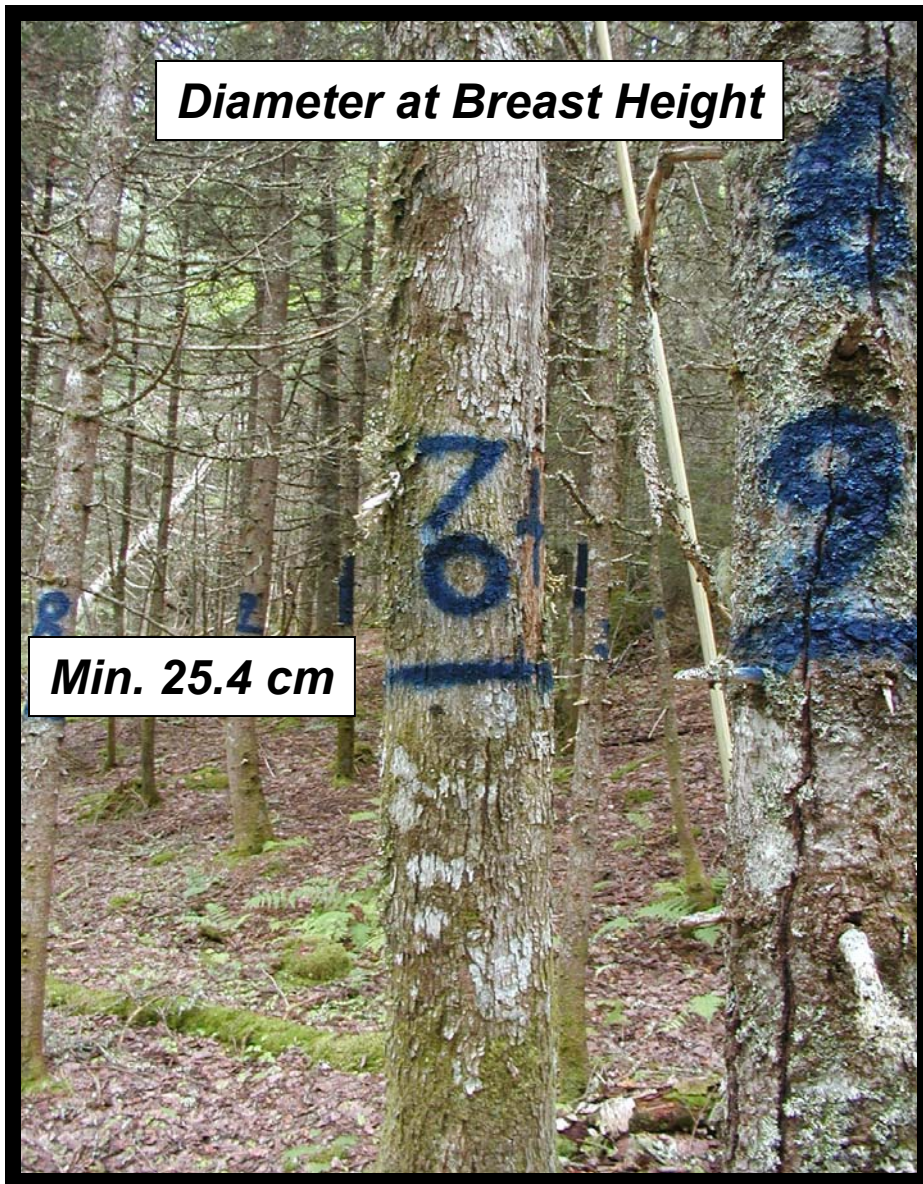
- | | |
|-----------------------------|----------------------------|
| 1. Black Ash | 9. Red Maple |
| 2. Black Cherry | 10. Red Oak |
| 3. Beech | 11. Sugar Maple |
| 4. Balsam Poplar | 12. Trembling Aspen |
| 5. Basswood | 13. White Ash |
| 6. English Oak | 14. White Birch |
| 7. Ironwood | 15. American Elm |
| 8. Large Tooth Aspen | 16. Yellow Birch |

Sawlog Assessment Step No. 2



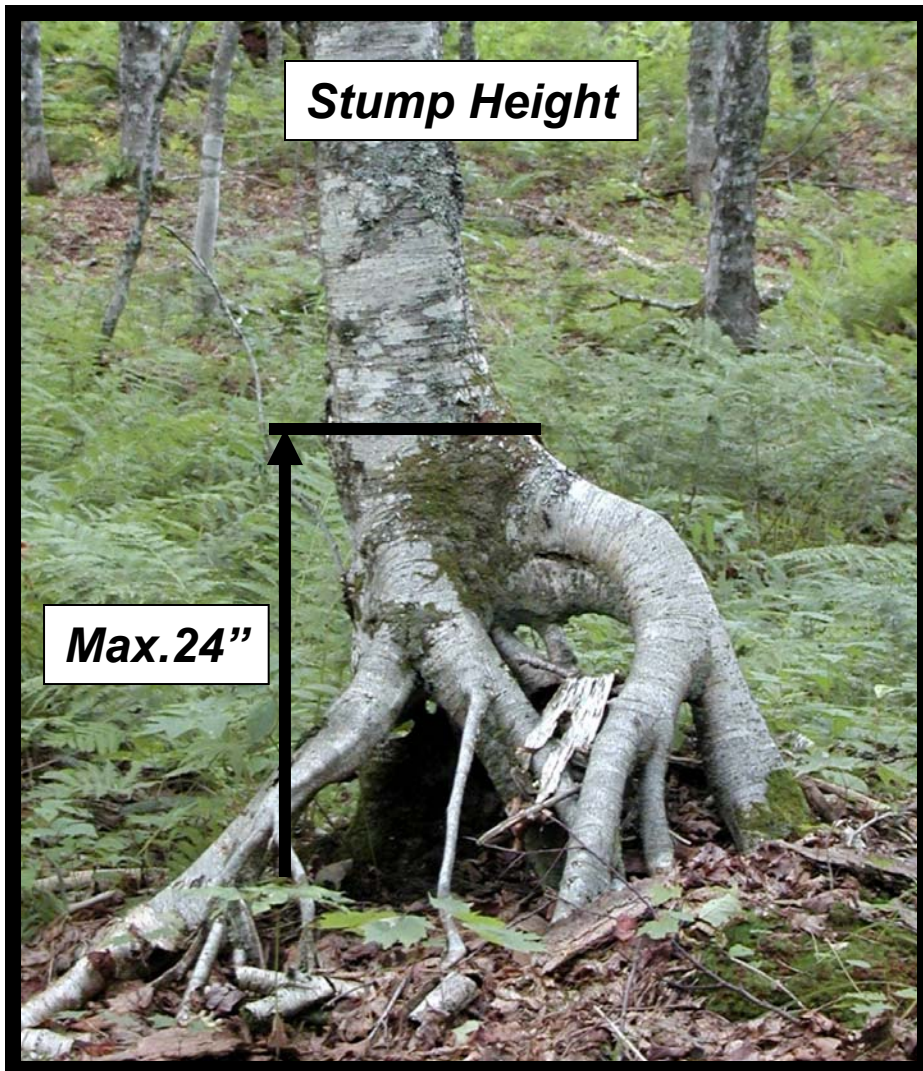
Check the status of the tree. To qualify as a hardwood sawlog tree ,the tree must have a status of “live” . Dead trees do not qualify as sawlog trees and should not be graded.

Sawlog Assessment – Step No. 3

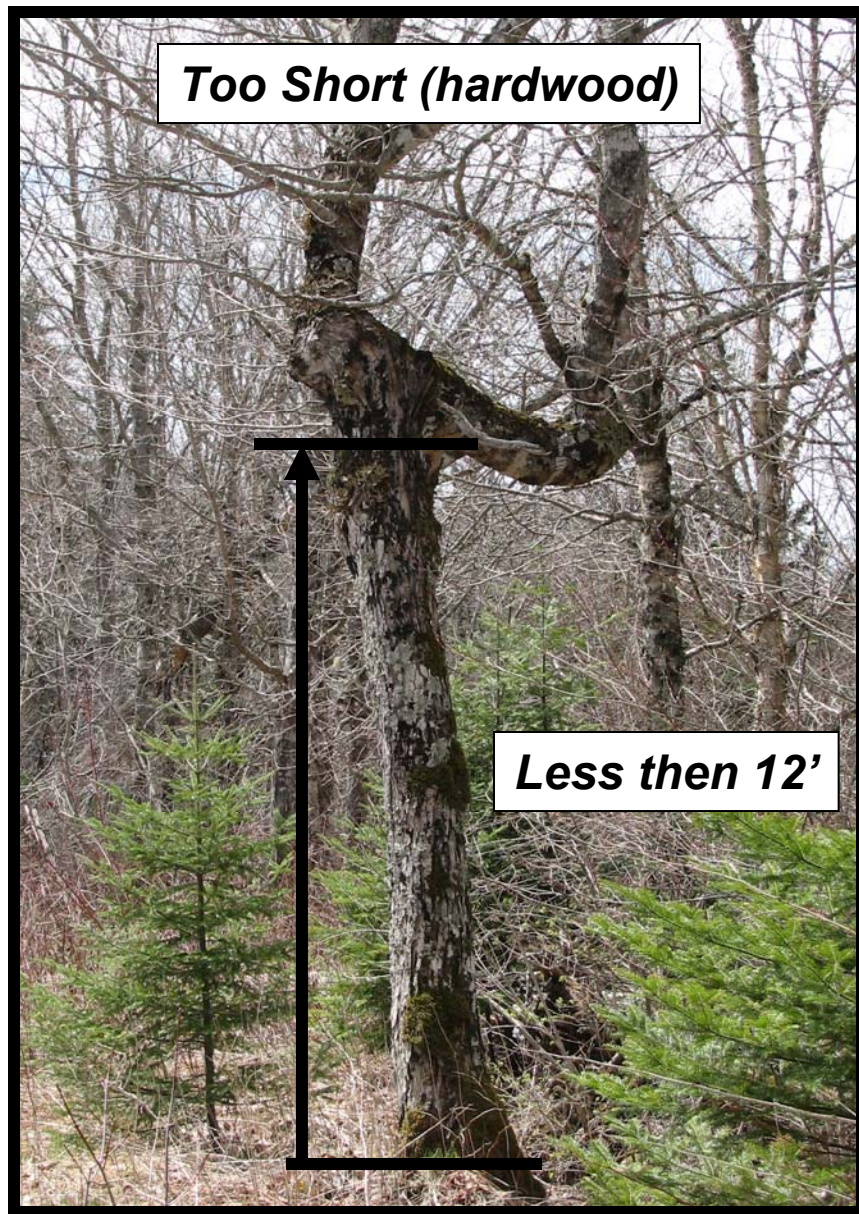


To qualify as a hardwood sawlog tree, the tree must have a minimum DBH of 25.4 cm. Trees with a DBH of less than 25.4 cm should not be graded as a sawlog tree.

Sawlog Assessment - Step No. 4

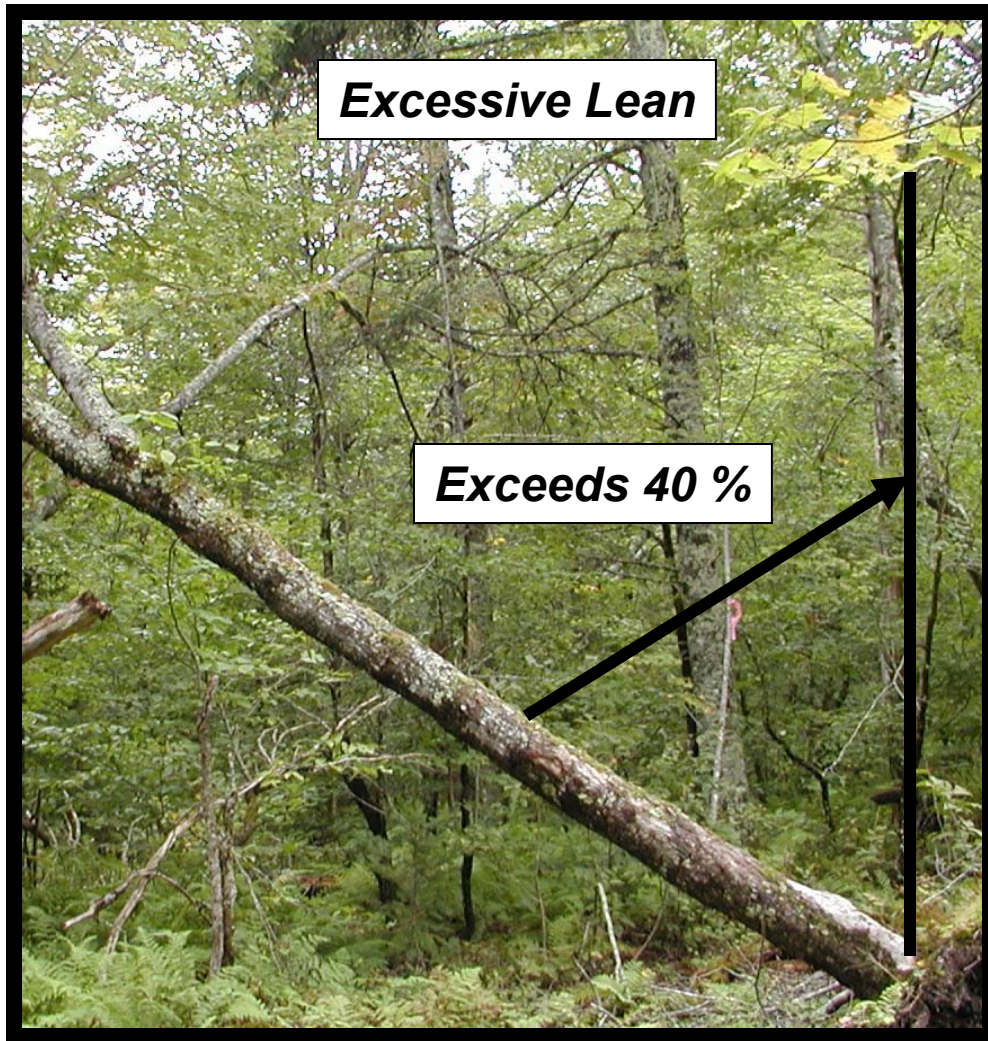


Establish the stump height for the tree. Do this by estimating how far up the bole a cutter would go when felling the tree. The maximum height should be 24". Stump height is important as this will determine the starting point for all tree grade measurements on the bole. Mark the stump height with blue paint.



Determine how much of the first 16' of the bole is of sawlog quality. If the form of this section of the bole is so poor that it will never yield a 12' sawlog with a minimum 8" top, the tree should not be graded as a sawlog tree. Use damage code "Too Short (hardwood)."

Sawlog Assessment Step No. 6



Check the tree for excessive lean. If the lean exceeds 22.5 degrees (40%), the tree should not be graded as a sawlog tree. Use damage code "Excessive Lean". This damage code is not to be used for trees that have been wind thrown since the last plot measurement.

Sawlog Assessment Step No. 7



Check the bole for excessive rot. If 75% or more of the merchantable section of the bole is rotten, the tree should not be graded as a sawlog tree. Use damage code "Excessive Rot".

Sawlog Assessment Step No. 8



Severe Sweep

Determine the amount of sweep in the 16' grading section of the bole. If the sweep deflection exceeds 24", the tree should not be graded as a sawlog tree. Use damage code "Severe Sweep."



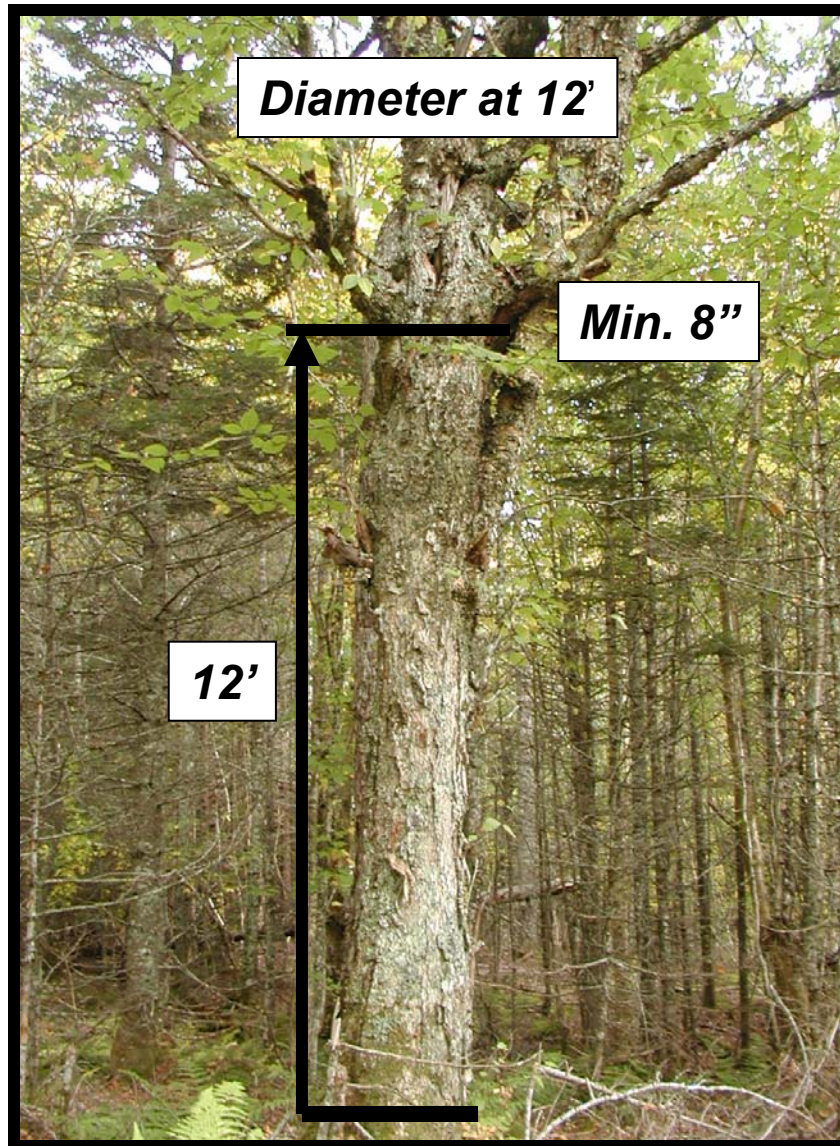
*Check the bole for excessive grade defects. If the grading section of the bole has two or more faces that **will never** yield 6' or more, of clear cuttings, minimum of 2' in length, use damage code "Excessive Grade Defects."*

SECTION TWO

HARDWOOD TREE GRADING

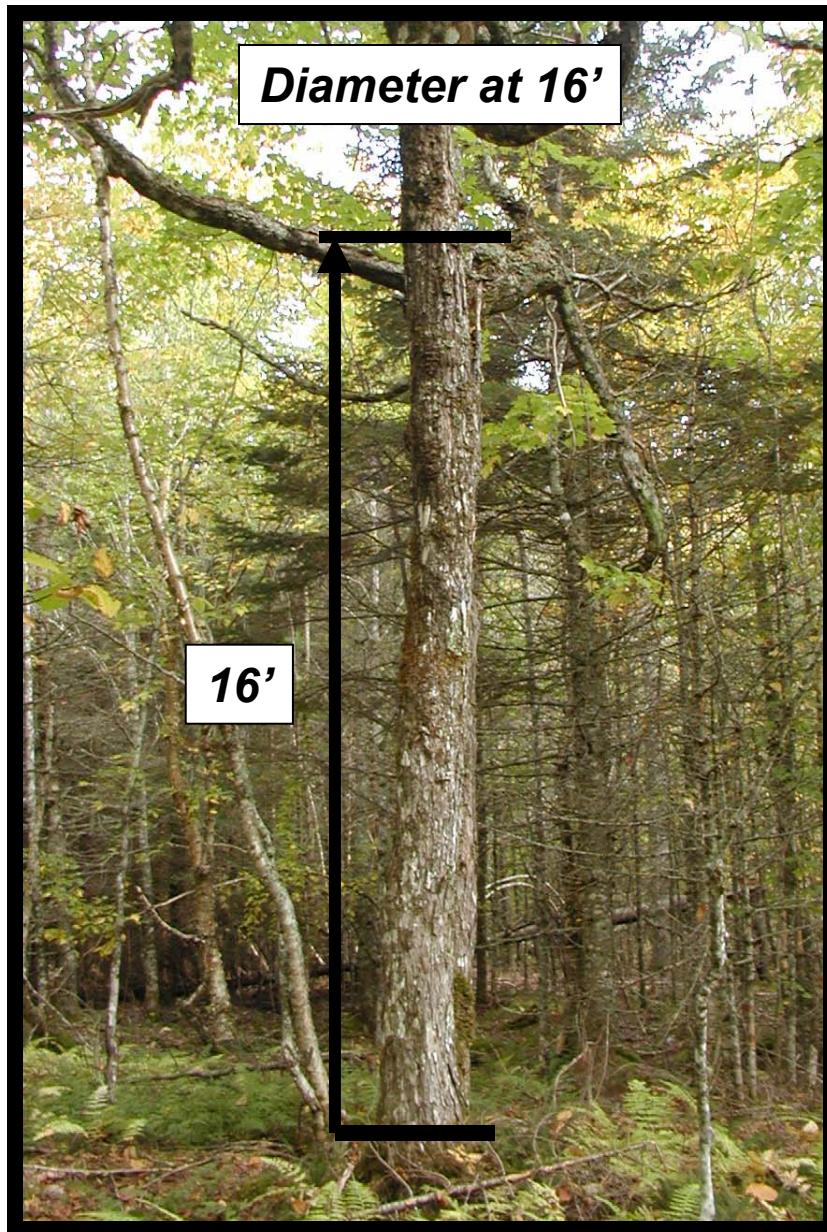
- ***Diameter at 12'***
- ***Diameter at 16'***
- ***Total sawlog length***
- ***Diameter top of total sawlog***
- ***Grading section***
- ***Sweep***
- ***Crook***
- ***Straight seam with rot***
- ***Other scale defects***
- ***Grading face***
- ***Clear cuttings***

Tree Grading Step No. 1



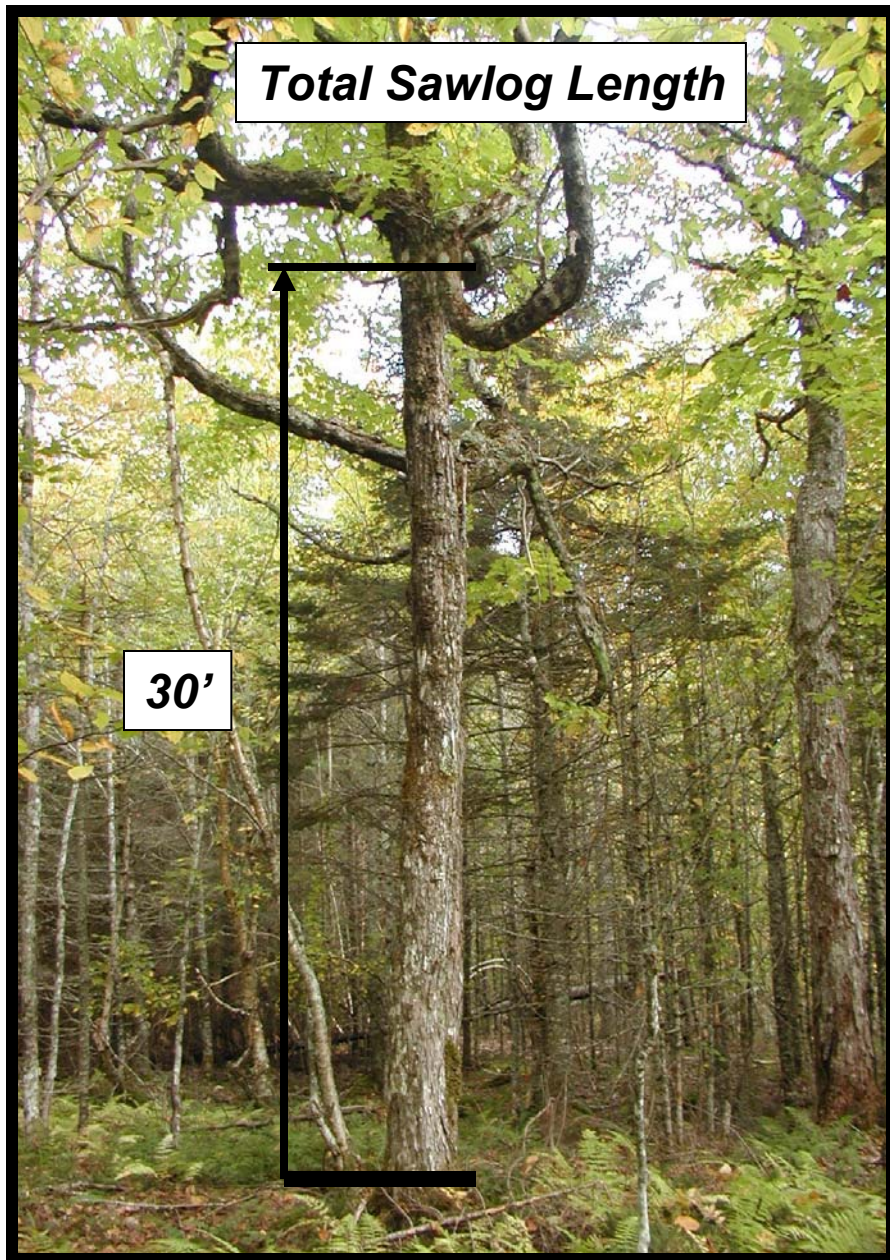
Estimate the diameter, inside bark, in inches, of the bole 12' above stump height. The diameter at 12' must be a minimum of 8" inside bark to qualify as a sawlog tree.

Tree Grading Step No. 2



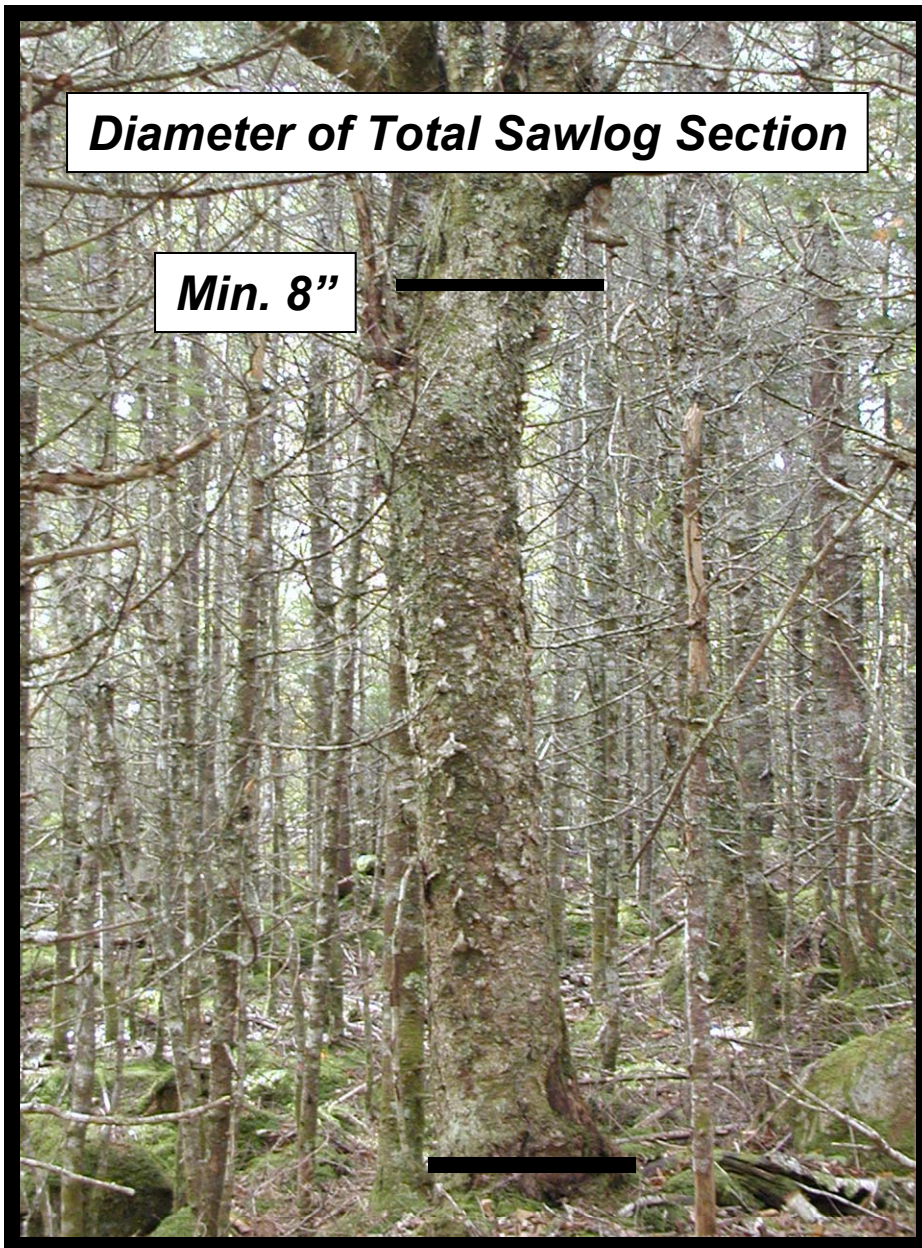
Estimate the diameter, inside bark, in inches, of the bole, 16' above stump height. This diameter can be less than 8".

Tree Grading Step No. 3



Estimate the total length of the bole, above stump height, in feet, which is of sawlog quality and has a minimum top diameter of 8" inside bark.

Tree Grading Step No. 4



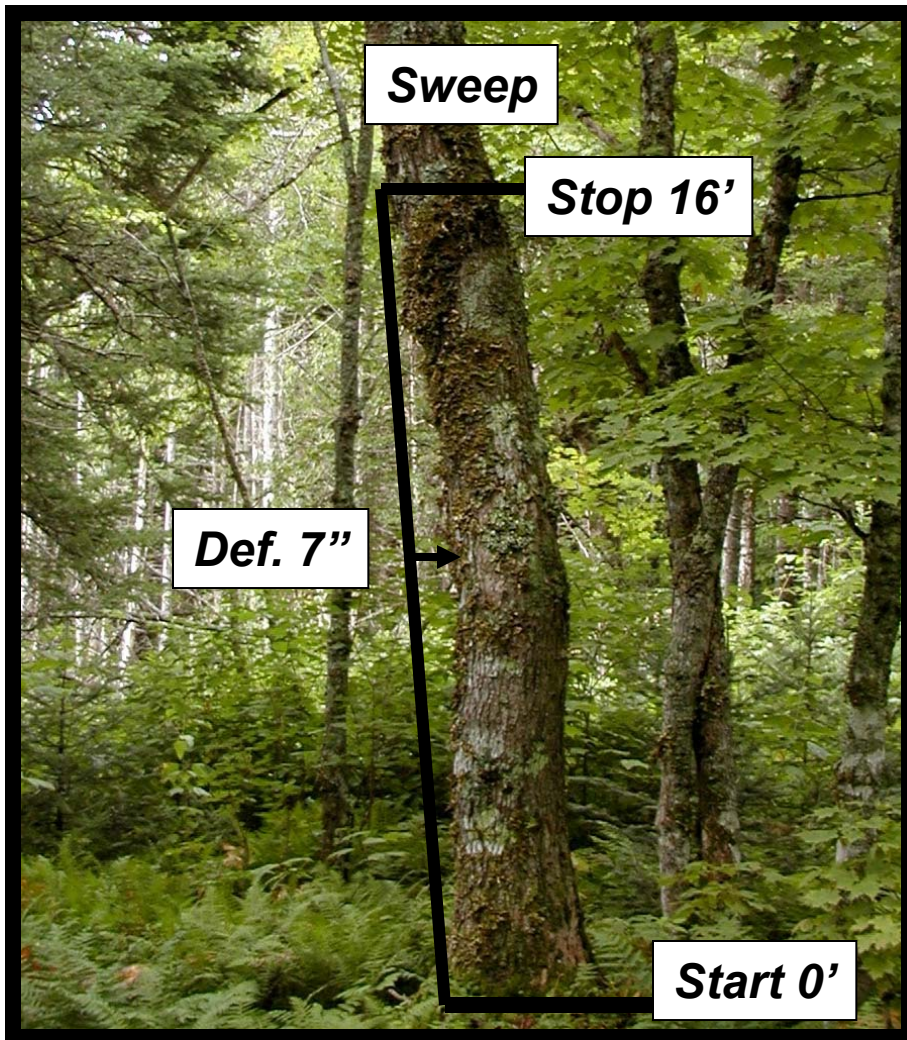
Estimate the diameter, inside bark, in inches of the bole at the top of the total sawlog quality portion of the bole. The top diameter must be a minimum of 8" inside bark.

Tree Grading Step No. 5



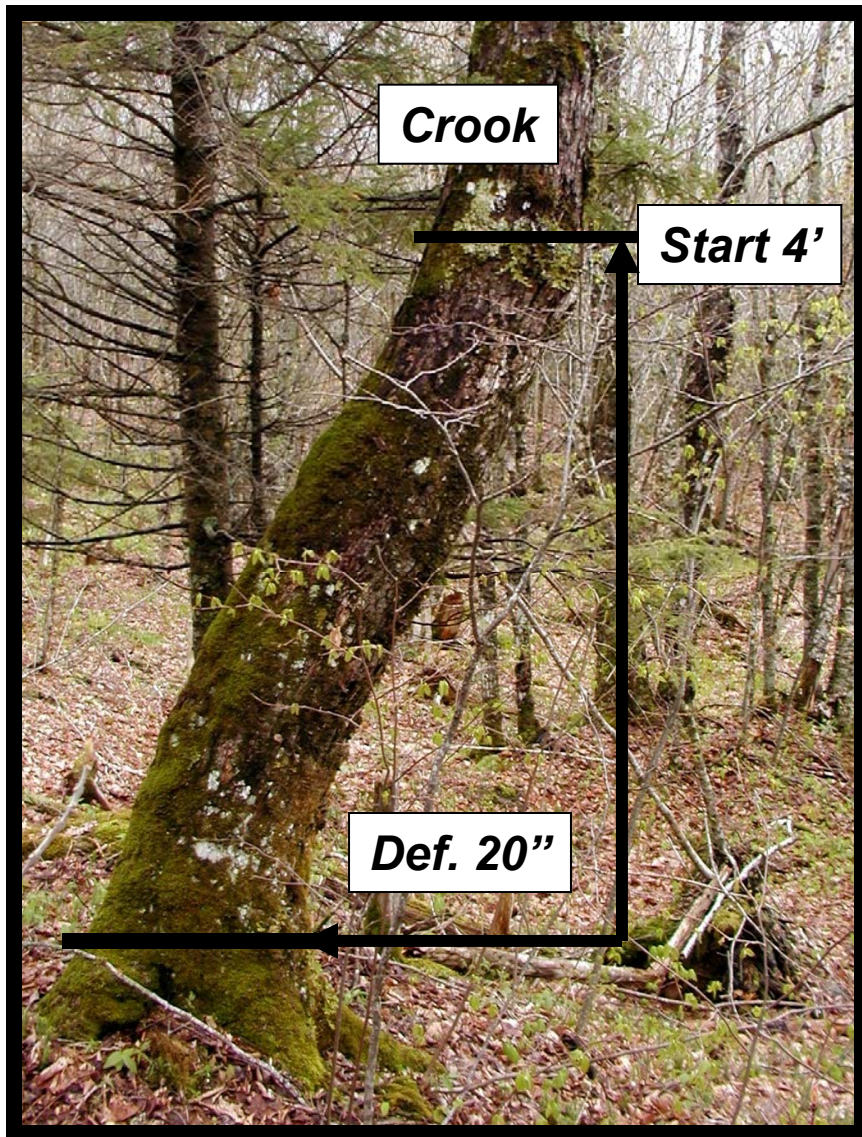
In most instances the grading section of the tree will be the first 16' section of the bole above stump height. However if the total merchantable sawlog length recorded in step No. 4 is less than 16' then the grading section must be equal to the total sawlog length. The grading section can only be 12', 13', 14', 15' or 16' in length.

Tree Grading Step No. 6

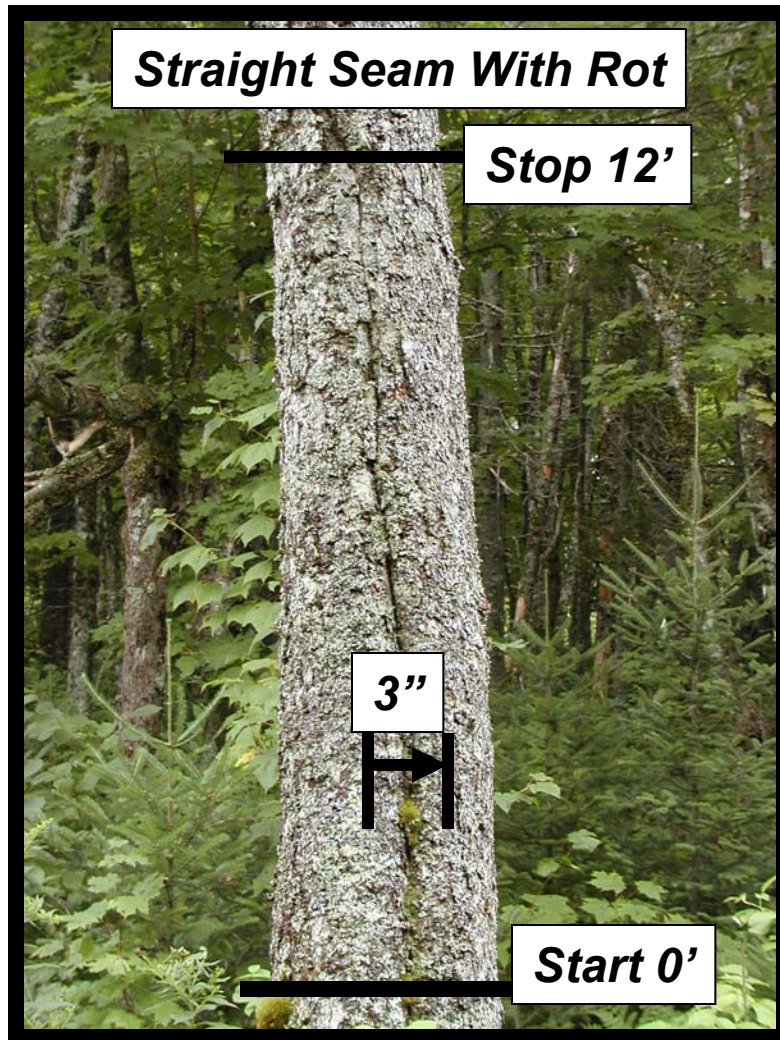


If Sweep is present on the grading section of the bole, record the start and stop of the sweep and measure the maximum deflection, in inches as illustrated. For trees with double sweep, add the two deflections together. Deflections of less than 2" do not have to be recorded. Sweeps less than 8' in length should be measured and recorded as crook.

Tree Grading Step No. 7

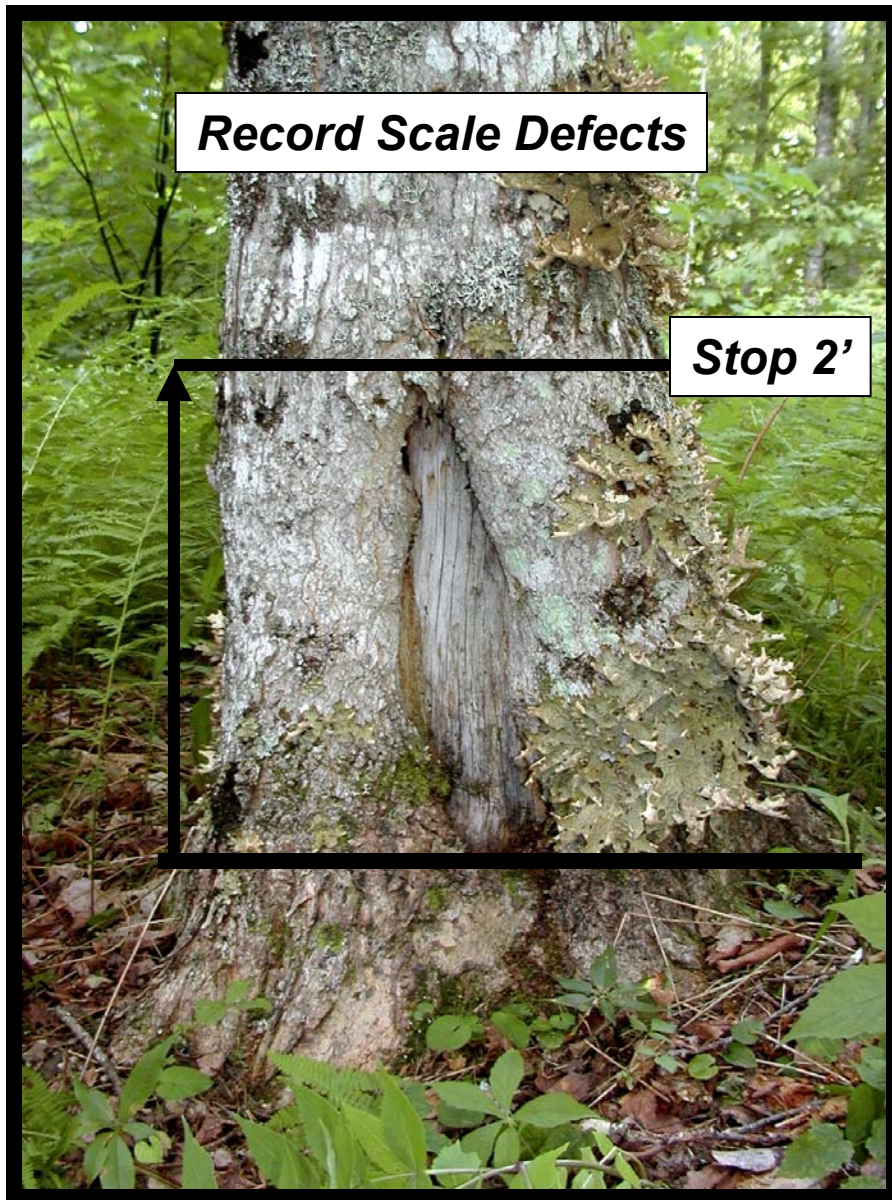


If Crook is present in the grading section of the bole, record the start and stop of the crook and measure the maximum deflection, in inches as illustrated. Deflections less than 2" do not need to be recorded. If there is a crook at both ends of the grading section, treat the defect as a double sweep and measure and record as such.



If there is a Straight Seam With Rot present within the grading section of the bole, measure and record the width of the seam in inches. Measure and record, to the nearest foot, above stump height, the start and stop of the seam. If there are more than one Straight Seams With Rot in the grading section record them as Wounds With Rot.

Tree Grading Step No. 9



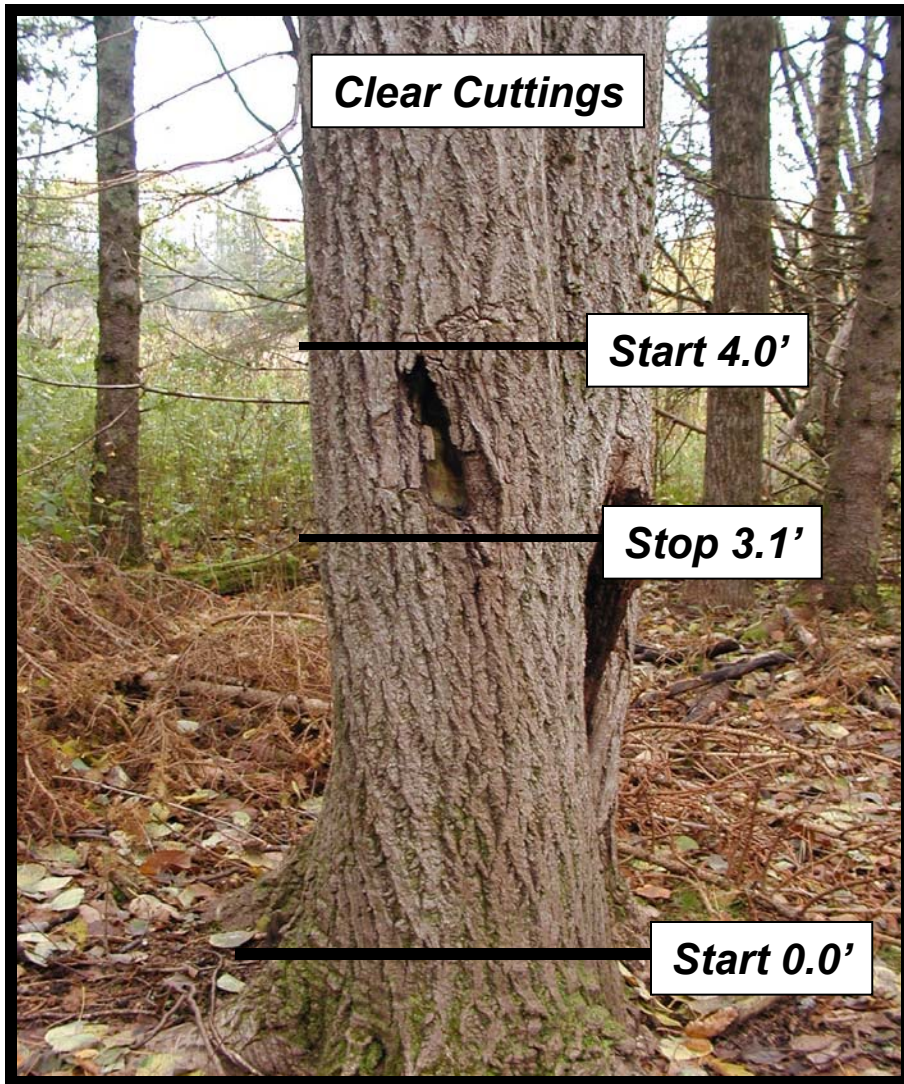
Locate and record the position and type of all other scale defects on all faces of the grading section. Record the start and stop of each scale defect to the nearest foot. See scale defect identification and measurement section for more detailed information on specific scale defects.

Tree Grading Step No. 10



Divide the grading section of the bole into four faces. Locate all grade defects on each face. Calculate the total length of clear cuttings (min. 2' in length), on each face. The face with the third lowest yield of clear cuttings is the grading face. Mark it with a "+".

Tree Grading Step No. 11



On the grading face, locate and record the start and stop of all clear cuttings that are a minimum of 2' in length. Clear cuttings are to be measured to the nearest tenth of a foot. See grade defect identification section for detailed information on a specific grade defect.

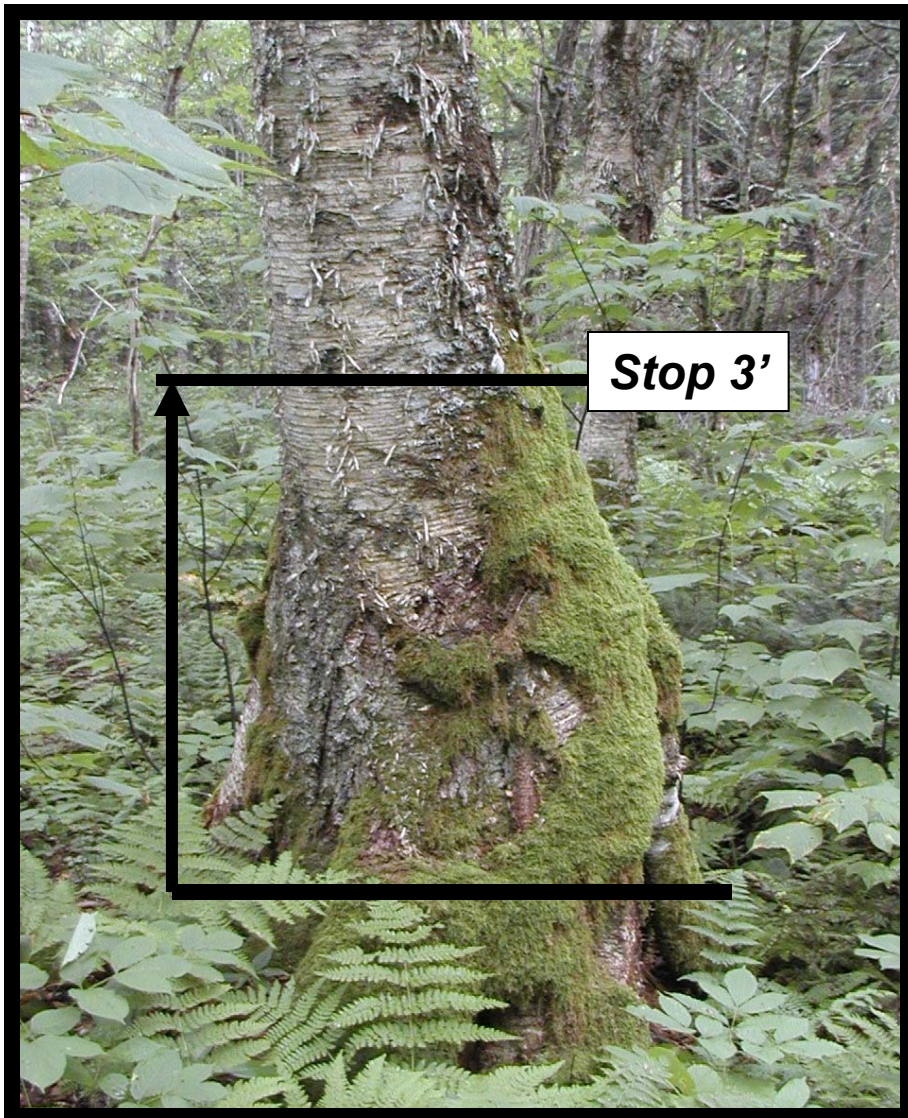
SCALE DEFECTS

IDENTIFICATION AND MEASUREMENT OF SCALE DEFECTS

- ***Butt Bulge***
- ***Butt Scar with rot***
- ***Canker with rot***
- ***Conks***
- ***Crook***
- ***Holes***
- ***Scars and Wounds with rot***
- ***Spiral Seam, no rot***
- ***Spiral Seam with rot***
- ***Stem Bulge***
- ***Straight seam, no rot***
- ***Straight Seam with rot***
- ***Sweep***
- ***Unsound Knot***

Note: Record scale defects on all faces of the grading section of the bole.

Scale Defect – Butt Bulge

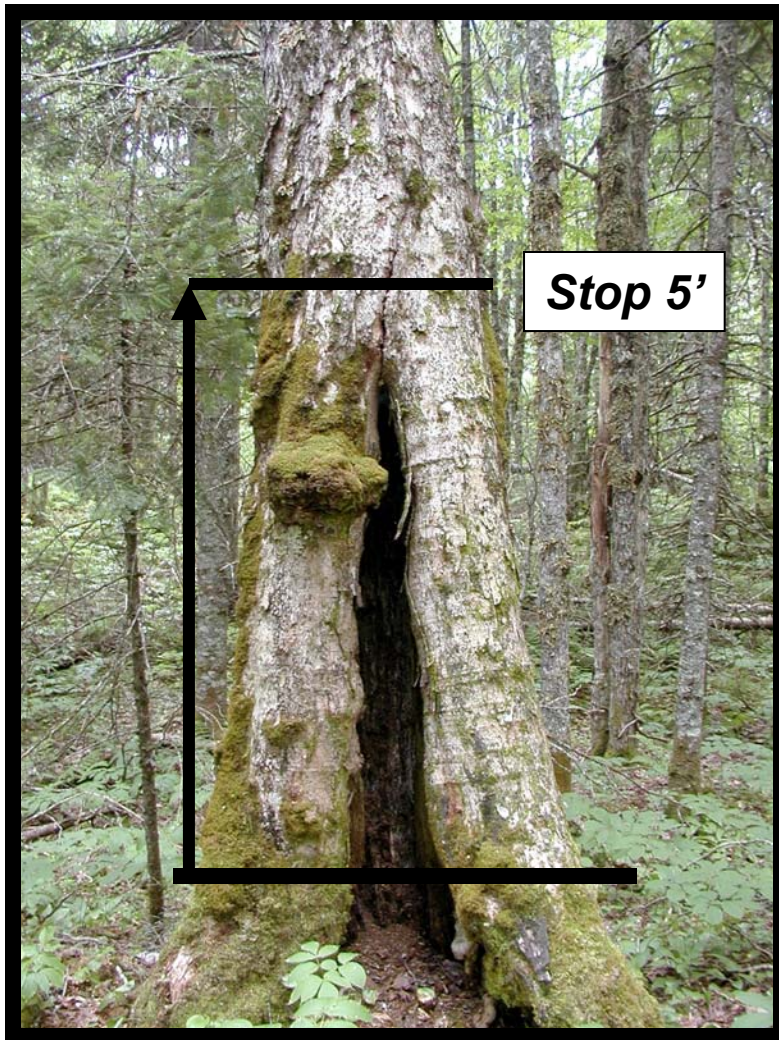


Butt Bulges are an unusual swelling or barreling shape at the base of the bole. The swelling indicates extensive internal rot. Measure and record to the nearest foot the distance above stump height to the end of the swelling.



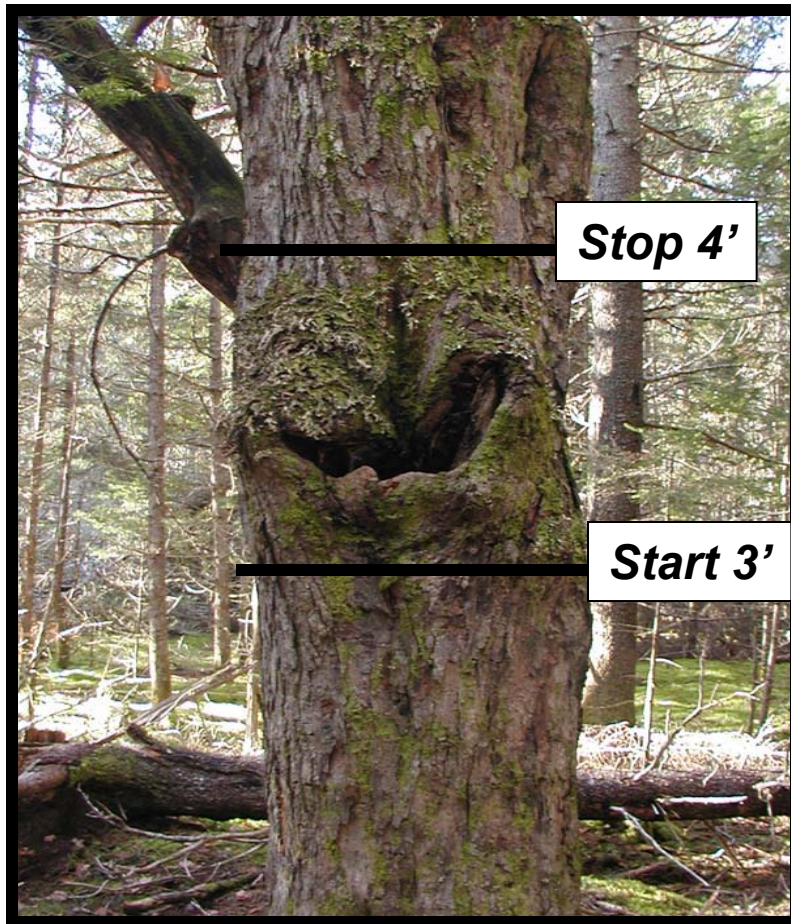
A Straight Seam With Rot is a longitudinal split in the bole of the tree, more than 2" in depth. The seam will be confined to one face. The seam will be open or wet and show signs of decayed wood. Measure and record the width of the seam, in inches. Measure and record, to the nearest foot, above stump height, the start and stop of the seam.

Scale Defect – Butt Scar With Rot



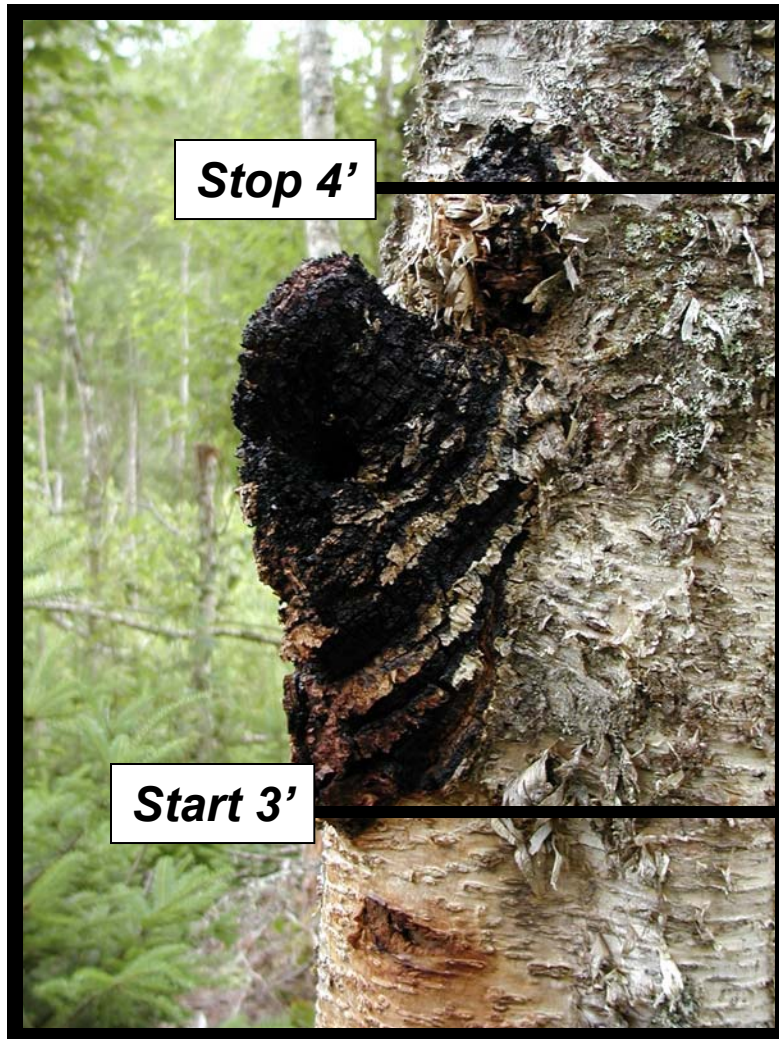
A Butt Scar With Rot is a triangular opening at the base of the bole. The scar may contain decayed wood or if advanced enough the wood may have rotted away leaving a hole. Measure and record the distance, to the nearest foot, above stump height to the end of the scar.

Scale Defect – Canker with Rot



Canker With Rot is a lesion, greater than 2" in depth, in the bark of the tree caused by a fungus growth which attacks and kills the cambium layer. Decay organisms have entered the underlying wood and created heart rot in the bole. The canker will cause the bole to swell and produce callus around the opening. Measure, to the nearest foot, the distance above stump height to the start and the stop of the swelling.

Scale Defect - Conks



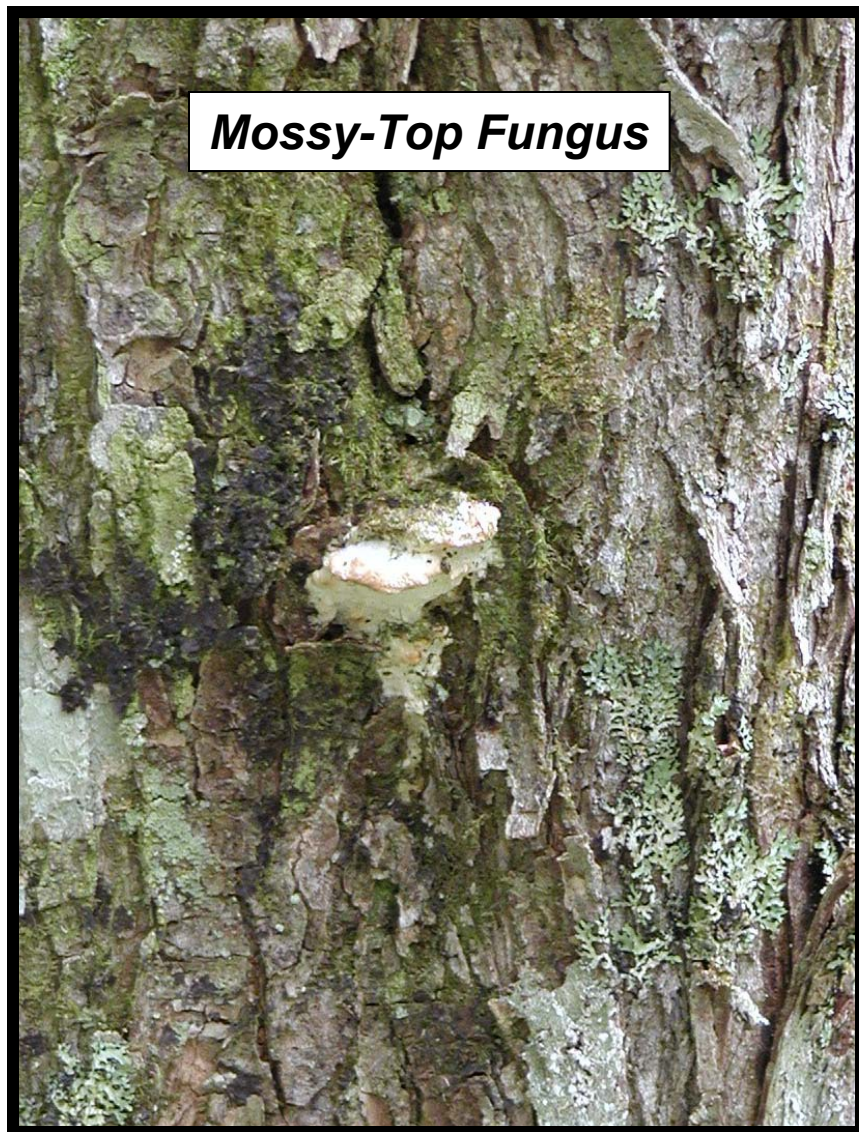
A Conk is the fibrous fruiting body of a wood rotting fungus .The presence of a conk on the bole of a tree indicates extensive internal rot. Measure the distance, to the nearest foot, above stump height, to the start and stop of the conk or any associated swelling.

Scale Defect - Conks cont.



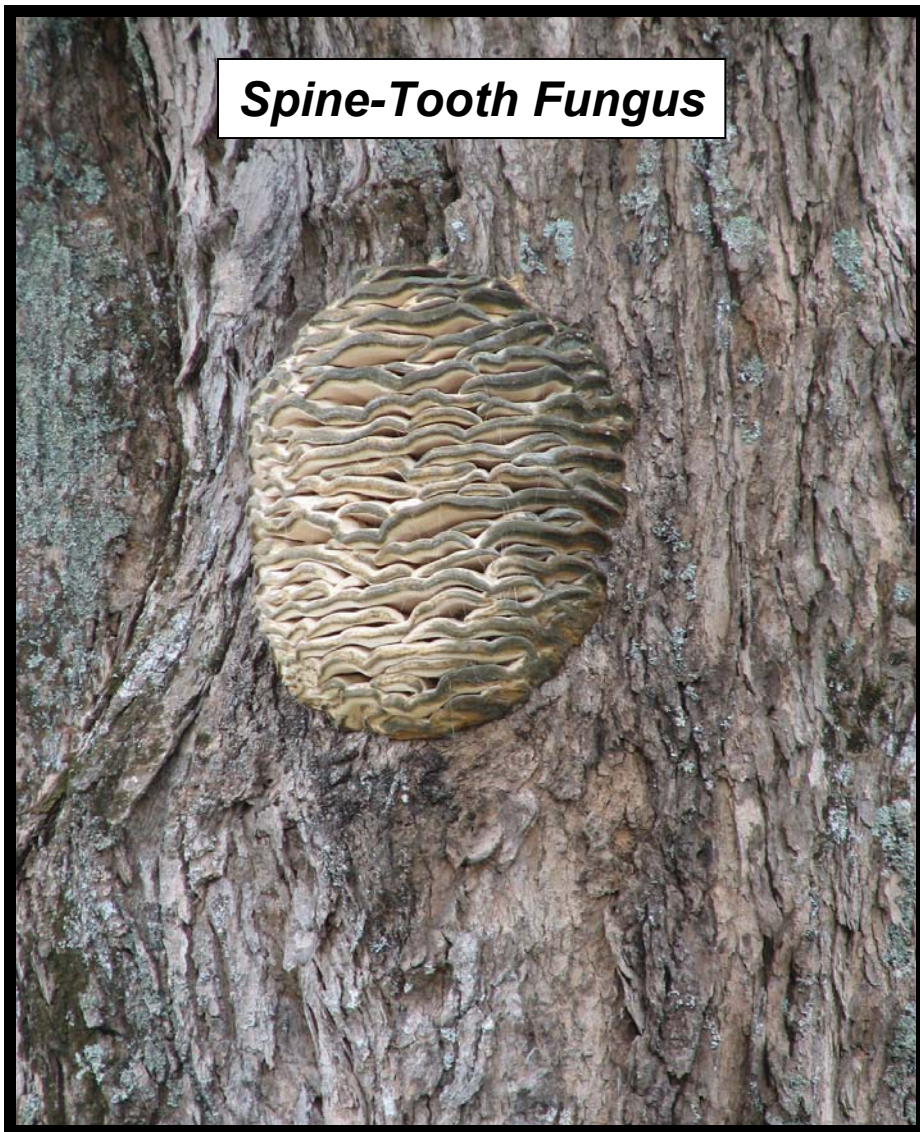
False Tinder Fungus is a hoof shaped conk. The top is grey/black with a whitish outer rim. The under-side is rust colored with small round pores. Found on most species of hardwood. The conk is perennial.

Scale Defect - Conks cont.



Mossy-Top Fungus is a white, soft conk. There is usually moss growing on the top of the conk. The underside of the conk is white with small pores. The conk has a soft, wet appearance. Usually found on Sugar Maple. The conk is perennial.

Scale Defect - Conks cont.



Spine-Tooth Fungus is a large, soft, spongy conk, growing in bracket-like clusters on the bole. There are small spines or teeth on the underside of the conk instead of pores. Found mainly on Sugar Maple. The conks are annual and are killed by frost in the fall.

Scale Defect - Conks cont.



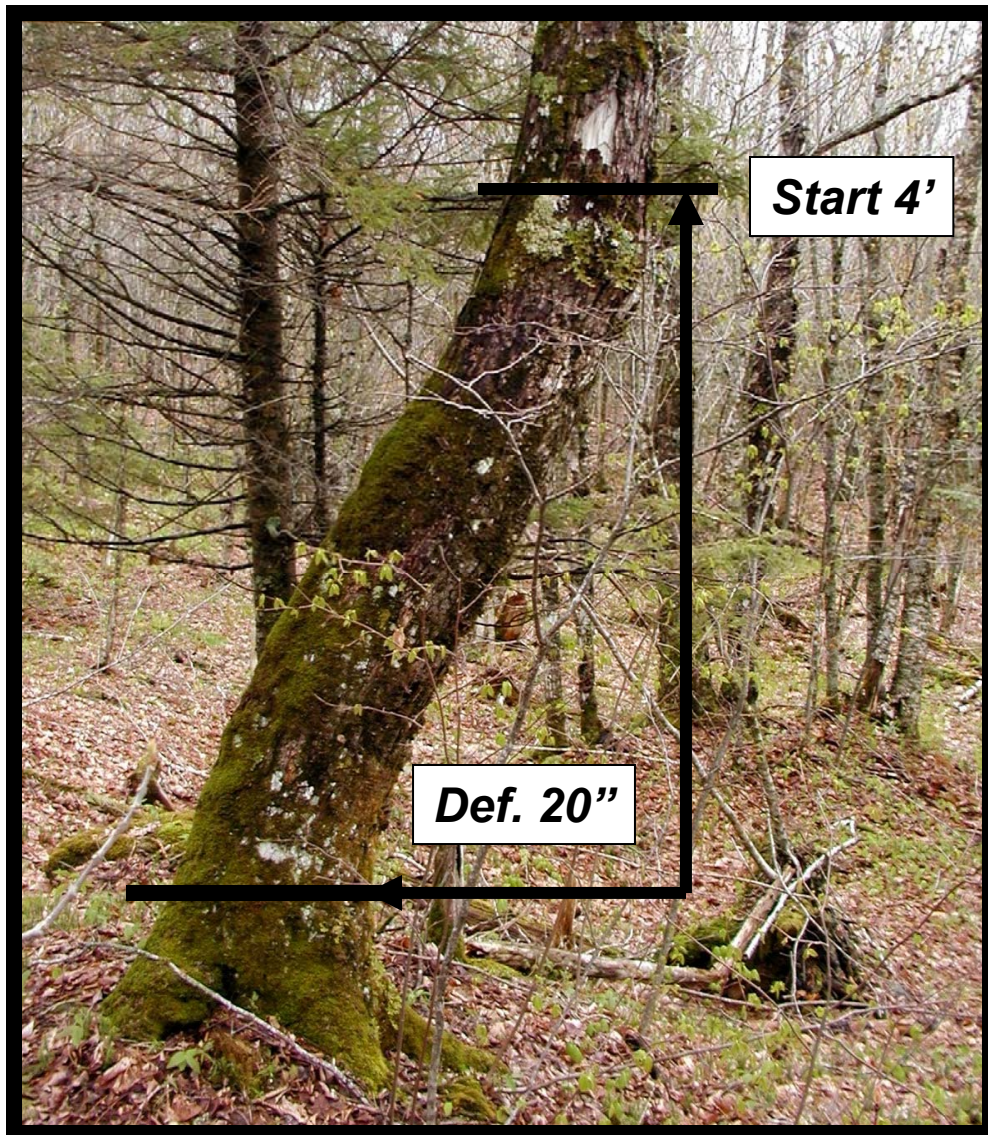
Cinder Conk forms large cinder like growths on the bole. The conk is yellowish at first but becomes black and rough with age. Found only on Yellow Birch. The conk is perennial.



An Artist's Conk has a grey, smooth top with concentric ridges. The underside is white and chalky and will turn brown when touched. The conk is perennial.

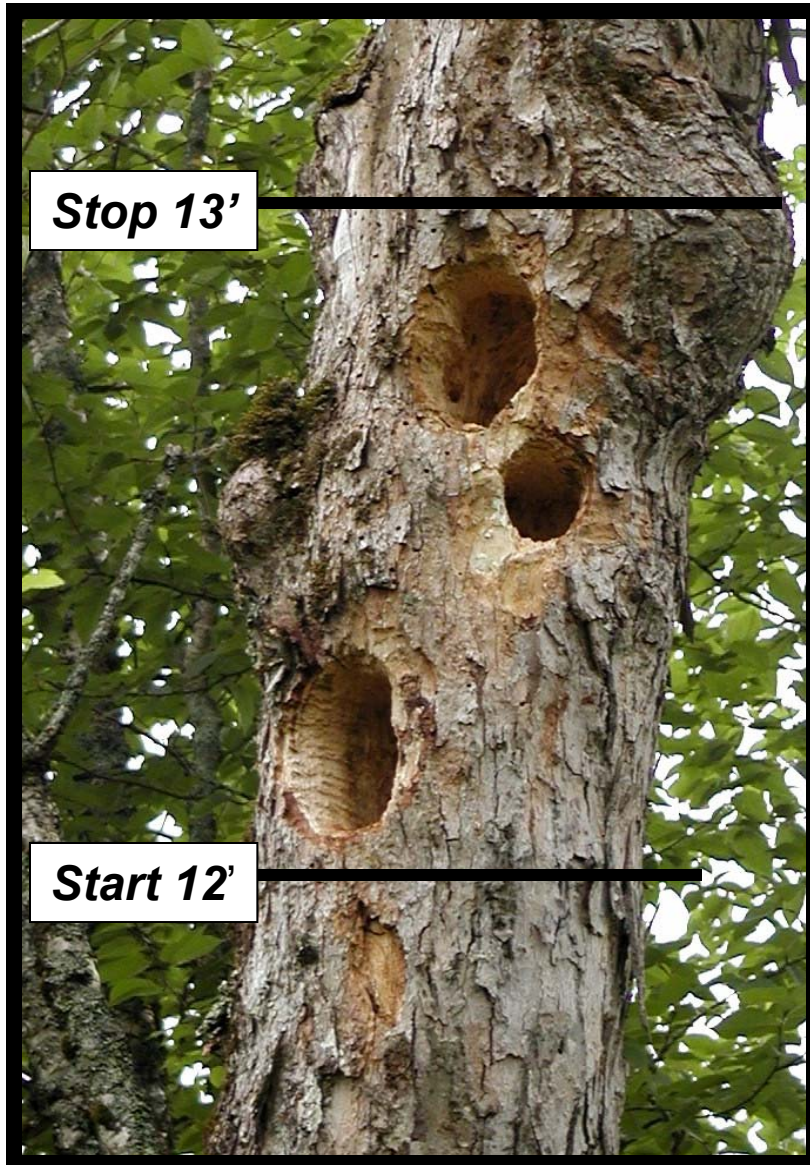


Tinder Fungus is a hoof-shaped conk. The top is hard and grey with concentric layers. The underside is grey-brown with large pores. Found mainly on Yellow Birch The conk is perennial..



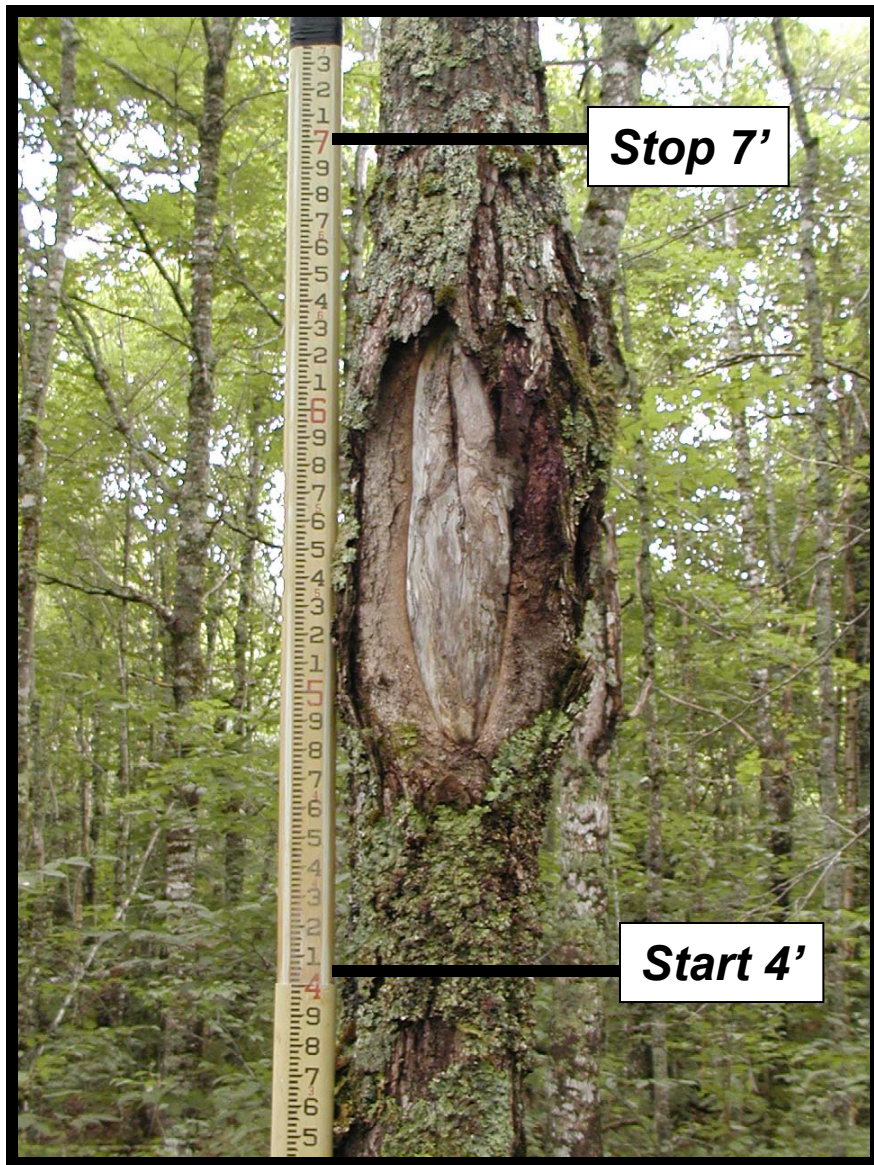
A Crook is an abrupt deviation in the direction of growth of the bole of the tree. If crook is present in the grading section of the bole, record where the crook starts on the bole and measure the maximum deflection, in inches, as illustrated. Deflections less than 2" do not need to be recorded.

Scale Defect – Holes



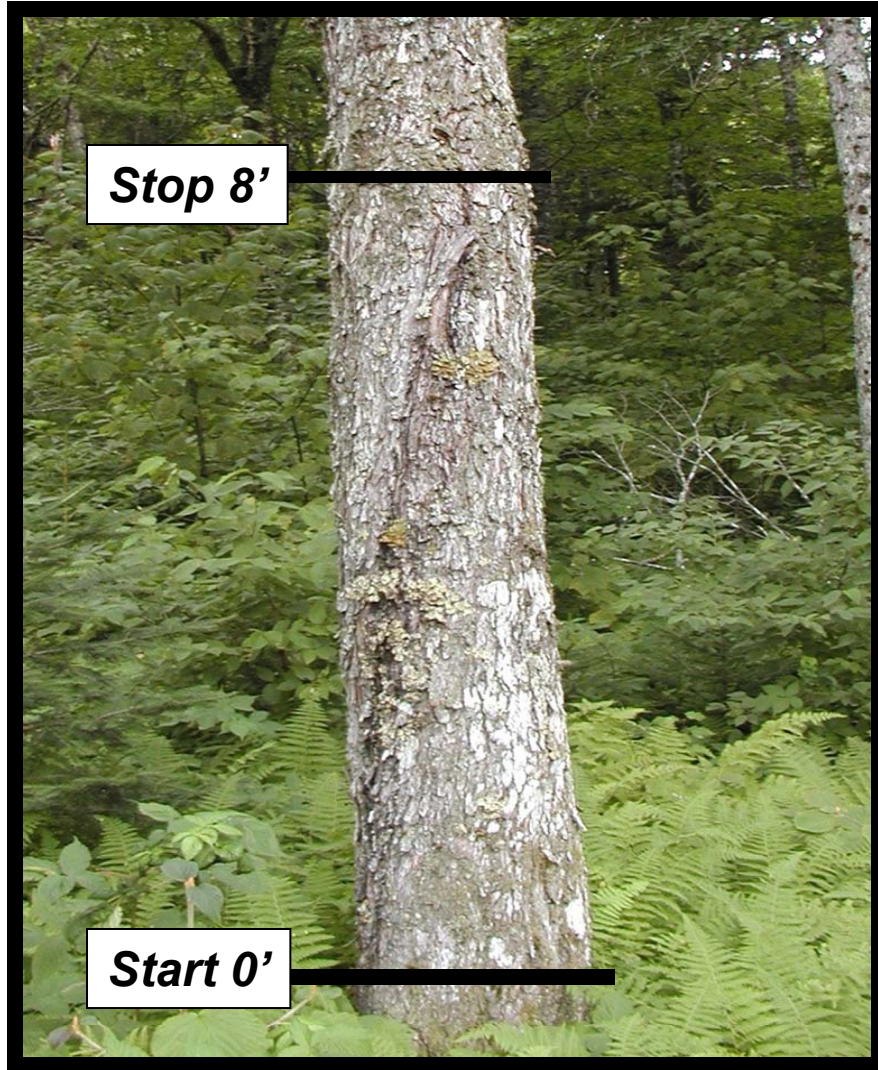
Holes are openings over $\frac{1}{2}$ " in diameter in the bole of the tree caused by rotten branches, woodpeckers or mechanical damage and are associated with Internal rot or decay. Measure and record, to the nearest foot, above stump height, the start and stop of the defect.

Scale Defect – Scars and Wounds with Rot



A Scar or Wound With Rot is any damage to the tree's bark, greater than 2" in depth, that has allowed decay organisms to enter the underlying wood. Measure and record, to the nearest foot, the start and stop of the defect.

Scale Defect - Spiral Seam, No Rot



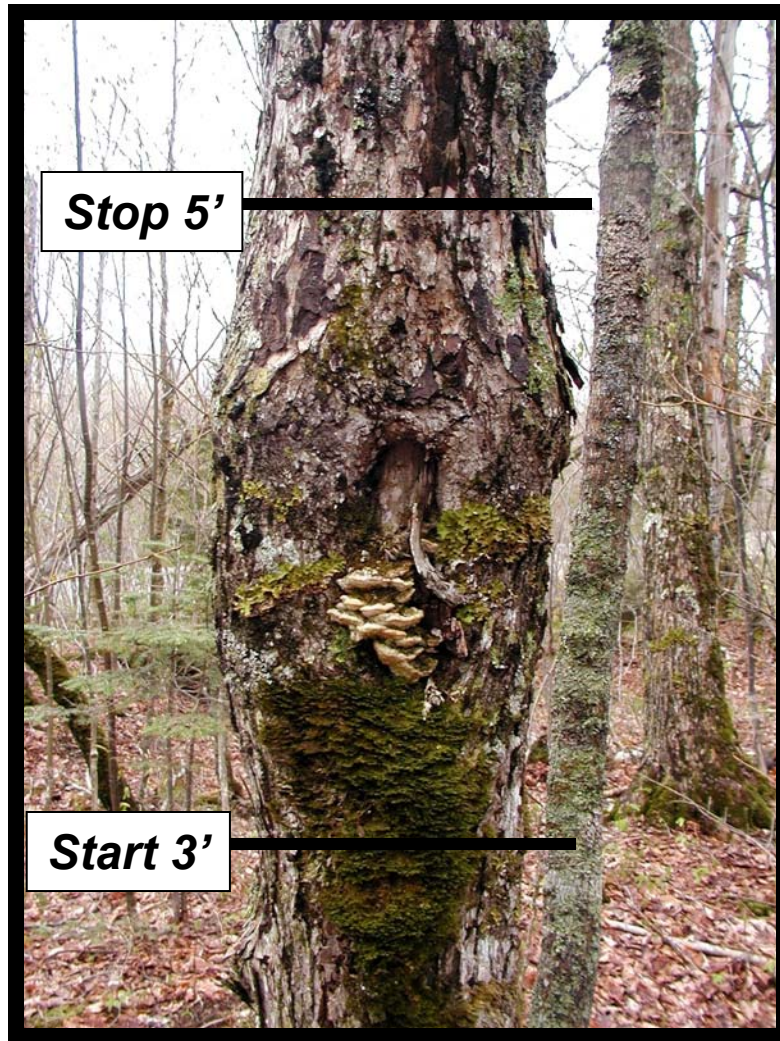
A Spiral Seam With No Rot is a longitudinal split in the bole, greater than 2" in depth. The seam will be closed and overgrown with callus material. The seam will be present on two or more faces of the grading section. Measure and record, to the nearest foot, above stump height, the start and stop of the defect.

Scale Defect – Spiral Seam With rot



A Spiral Seam With Rot is a longitudinal split in the bole of the tree, greater than 2" in depth, that is open and the underlying wood shows evidence of decay. The seam will be present on two or more faces of the grading section. Measure and record, to the nearest foot, above stump height the start and stop of the defect.

Scale Defect – Stem Bulge



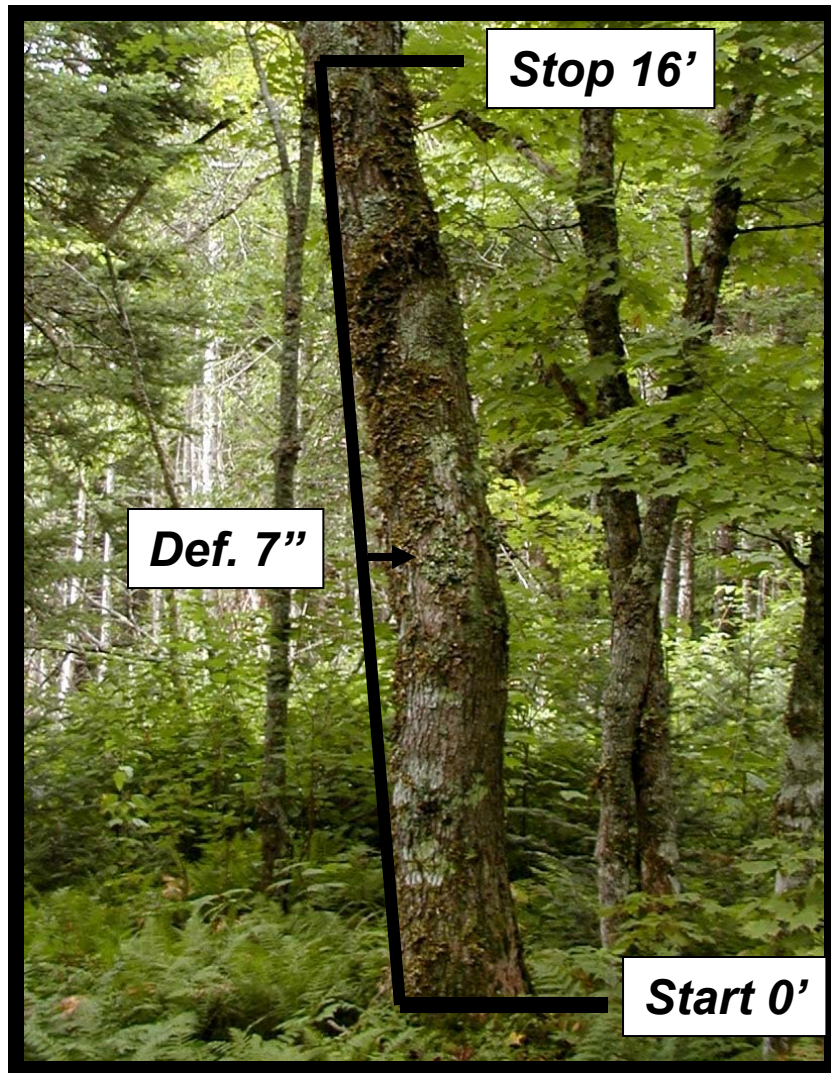
A Stem Bulge is an enlargement of the bole of the tree that begins at least 2' above stump height. Any swellings below 2' will be considered butt swells. The swelling indicates extensive internal rot. Measure and record, to the nearest foot, above stump height, the start and stop of the swelling.

Scale Defect – Straight Seam, No Rot



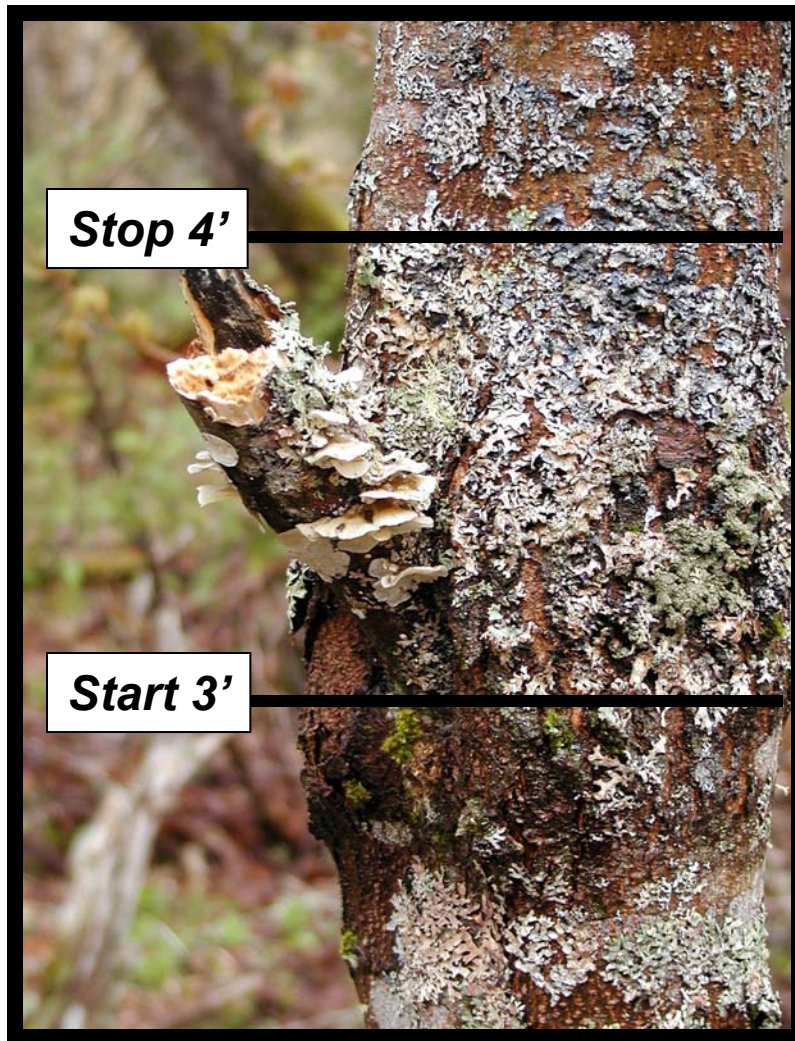
A Straight Seam With No Rot is a longitudinal split in the bole of the tree, greater than 2" in depth. The seam will be closed and overgrown with callus material. The seam will be present on only one face of the grading section. Measure and record, to the nearest foot, above stump height, the start and stop of the defect.

Scale Defect - Sweep



Sweep is a gradual curvature of the bole of the tree. If sweep is present on the grading section of the bole, record the start and stop of the sweep and measure the maximum deflection, in inches, as illustrated. For trees with double sweep, add the two deflections together. Deflections of less than 2" do not have to be recorded. Sweeps less than 8' in length should be measured and recorded as crook.

Scale Defect – Unsound Knot



An Unsound Knot is a broken off branch protruding from the bole. The stub will be soft and punky indicating rot has entered the bole of the tree. Measure and record, to the nearest foot, above stump height, the start and stop of the defect.

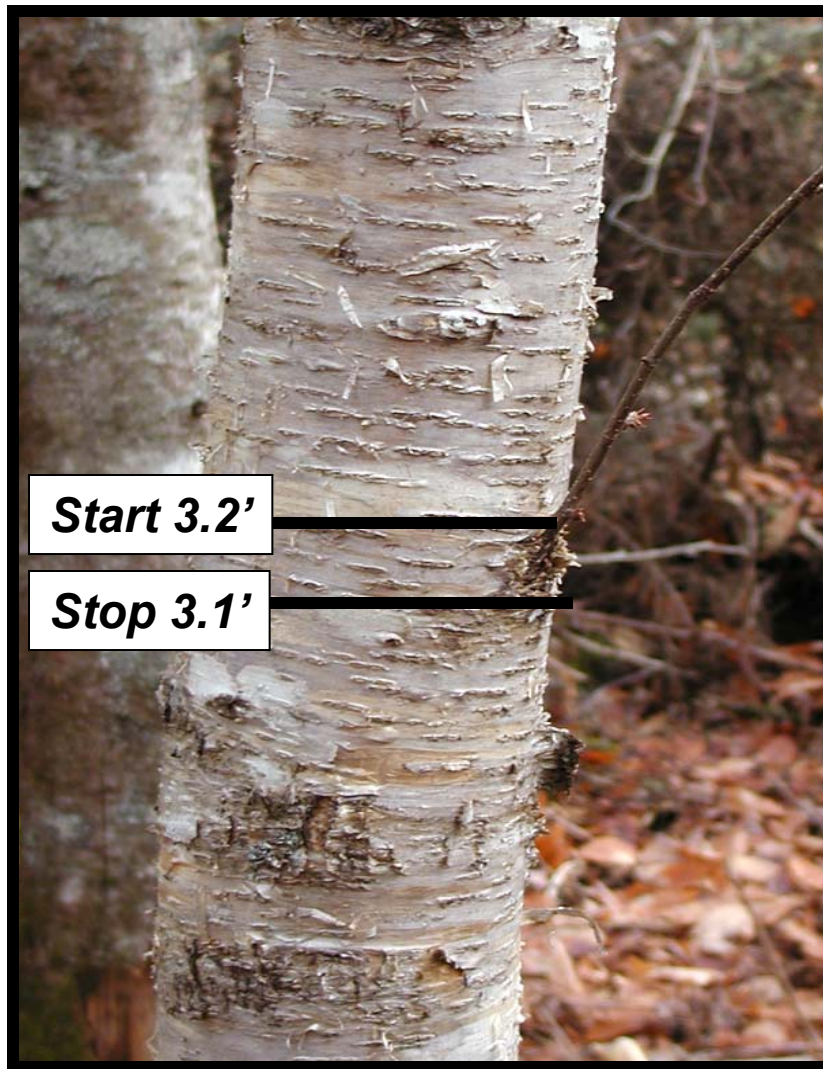
Clear Cuttings

IDENTIFICATION OF GRADE DEFECTS AND THEIR AFFECT ON LENGTH OF CLEAR CUTTINGS

- ***Adventitious Twigs***
- ***Bark Distortions***
- ***Bird Pecks***
- ***Branches***
- ***Bumps (high, medium, low)***
- ***Burls***
- ***Butt Bulges***
- ***Butt Scars***
- ***Cankers***
- ***Conks***
- ***Corky Bark***
- ***Holes***
- ***Knots***
- ***Overgrowths***
- ***Scars and wounds***
- ***Spiral Seams***
- ***Stem Bulges***
- ***Stem Lesions***
- ***Straight Seams***
- ***Worm Holes***

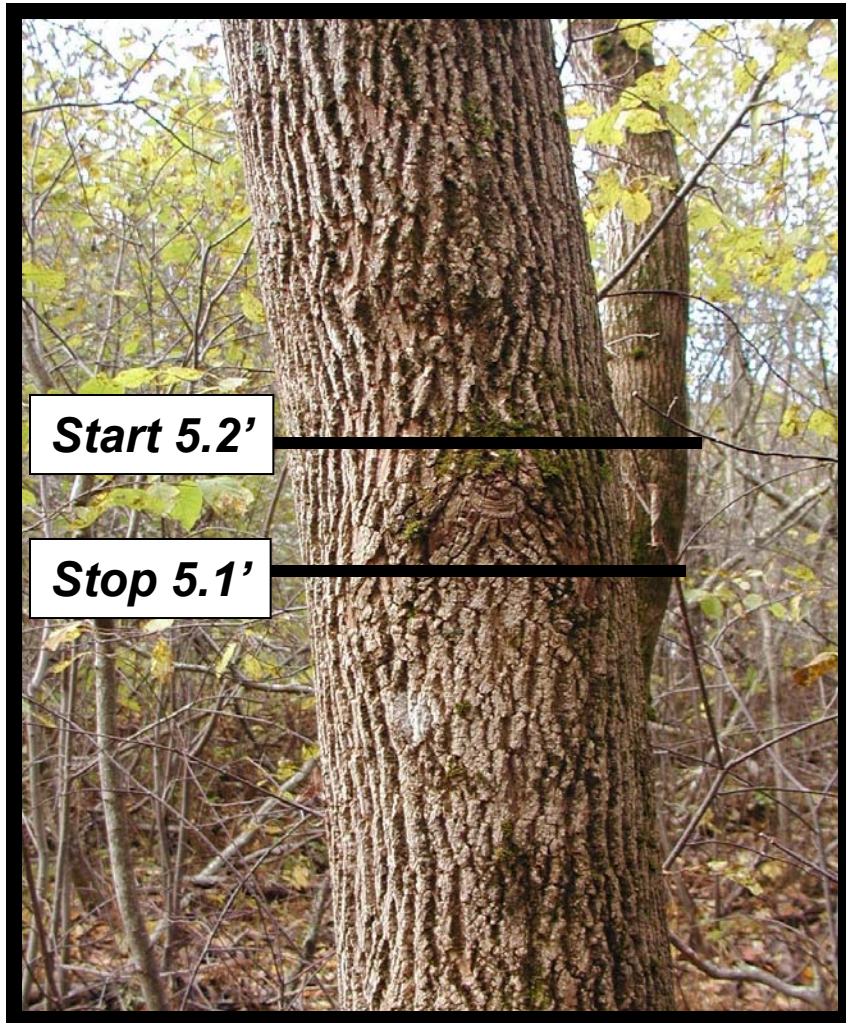
**** Measure clear cuttings to the nearest tenth of a foot.***

Grade Defect - Adventitious branches



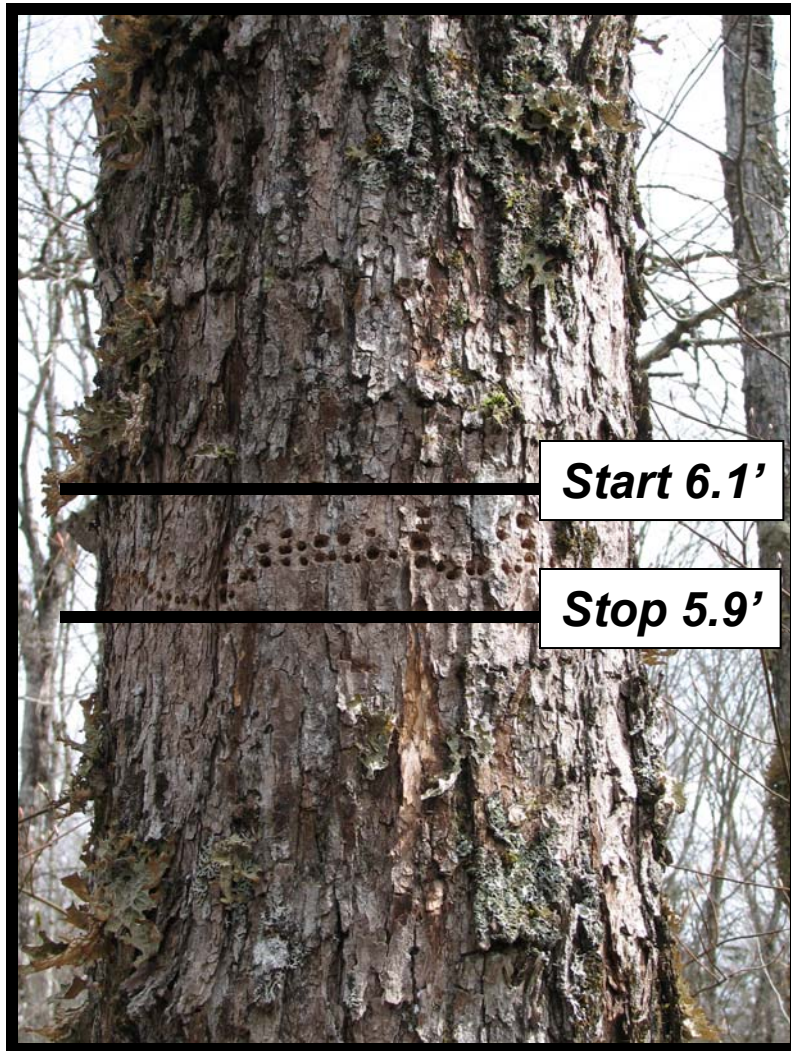
Adventitious branches originate in the cambium layer of the tree. They arise from dormant buds and can be activated by various stimuli. Small knots and bark pockets are associated with this defect. All adventitious branches over 3/8 " in diameter are considered grade defects. Stop clear cuttings at the branch collar and start clear cuttings on the opposite side just above the collar.

Grade Defect – Bark Distortion



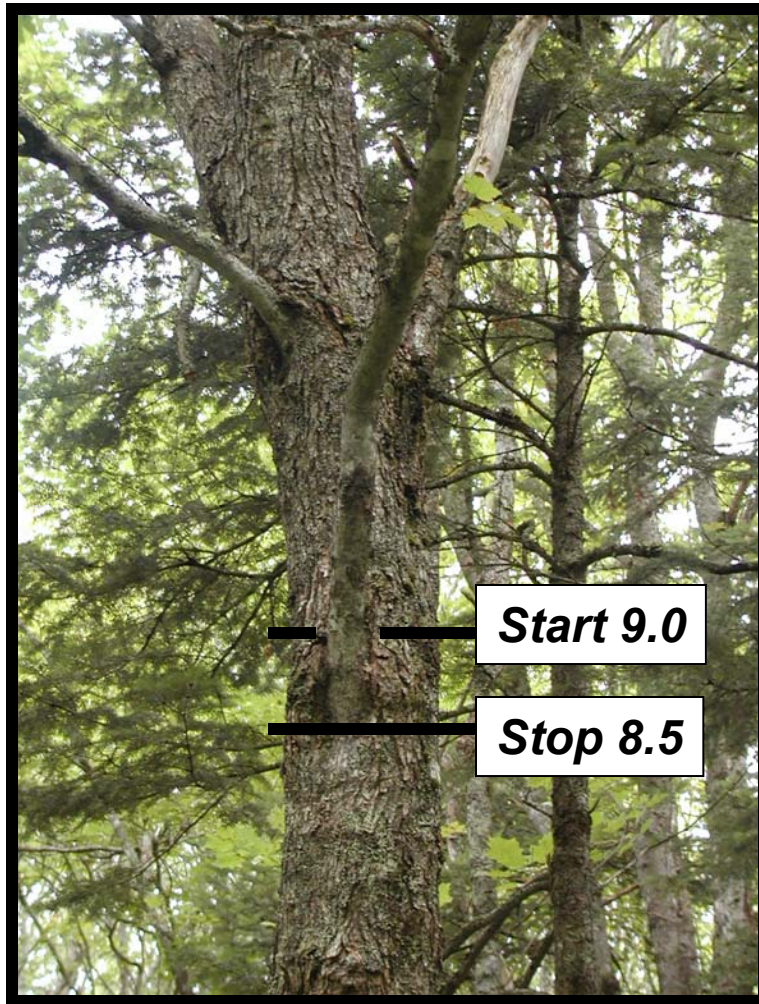
Bark distortions can best be described as a break in the normal pattern of the bark. They are the result of an overgrown defect, usually a knot. Bark distortions are always a grade defect. Stop clear cuttings where the bark pattern becomes irregular and start clear cuttings where the bark pattern returns to normal.

Grade Defect – Bird Pecks



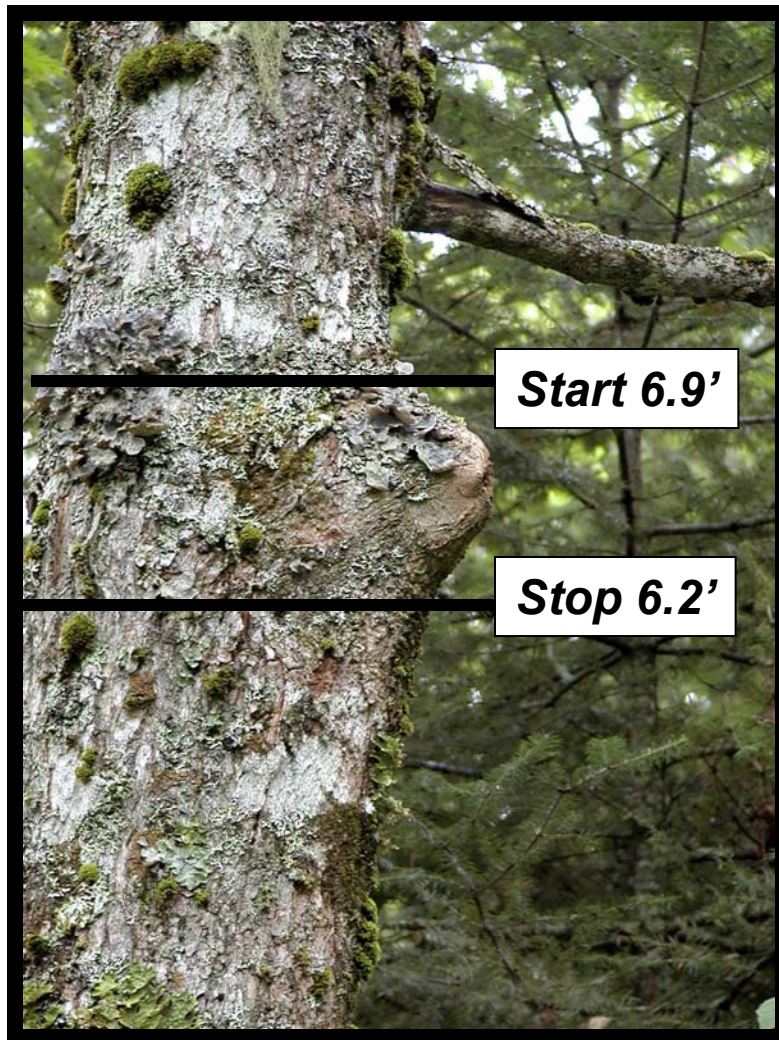
Bird pecks are horizontal rows of peck holes caused by the feeding of sapsuckers. The holes are about $\frac{1}{4}$ inch in diameter. When the pecks are fresh and there is no evidence of callus material they are not a defect. When the pecks are older and filled in with callus material they are a grade defect. Stop clear cuttings where the pecks appear on the grade face and start clear cuttings on the opposite side of the defect.

Grade Defect - Branches



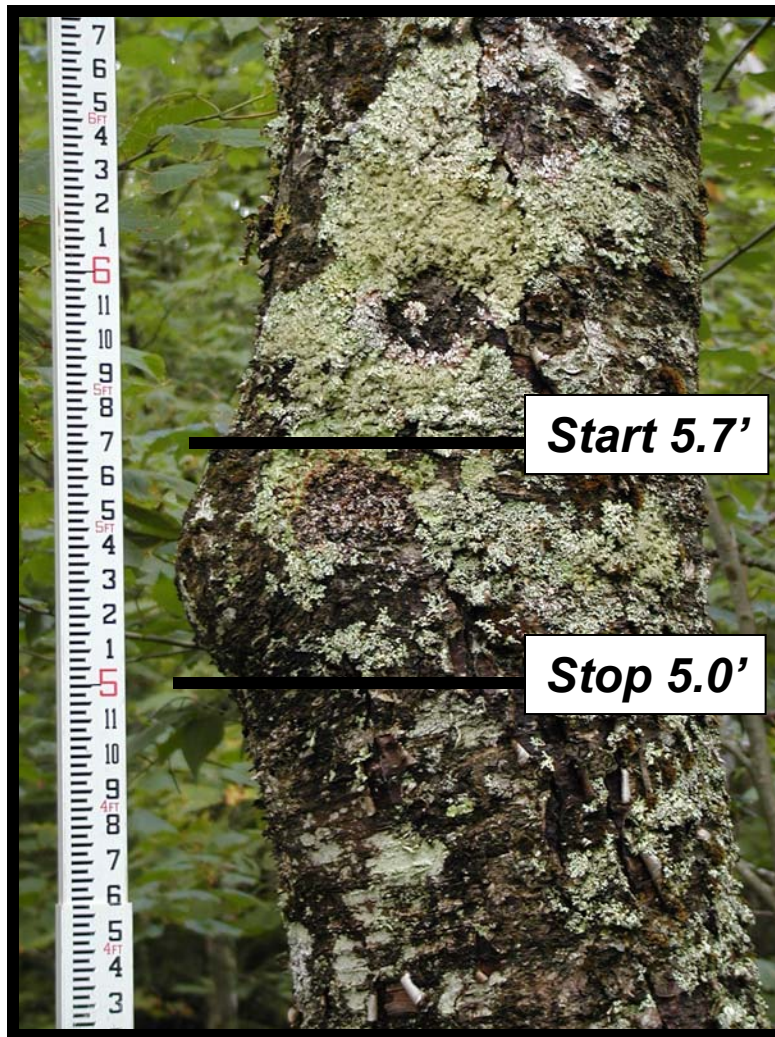
All Branches are grade defects. Stop clear cuttings at the collar of the branch and start clear cuttings on the opposite side just above the collar.

Grade Defect – Bump (High)



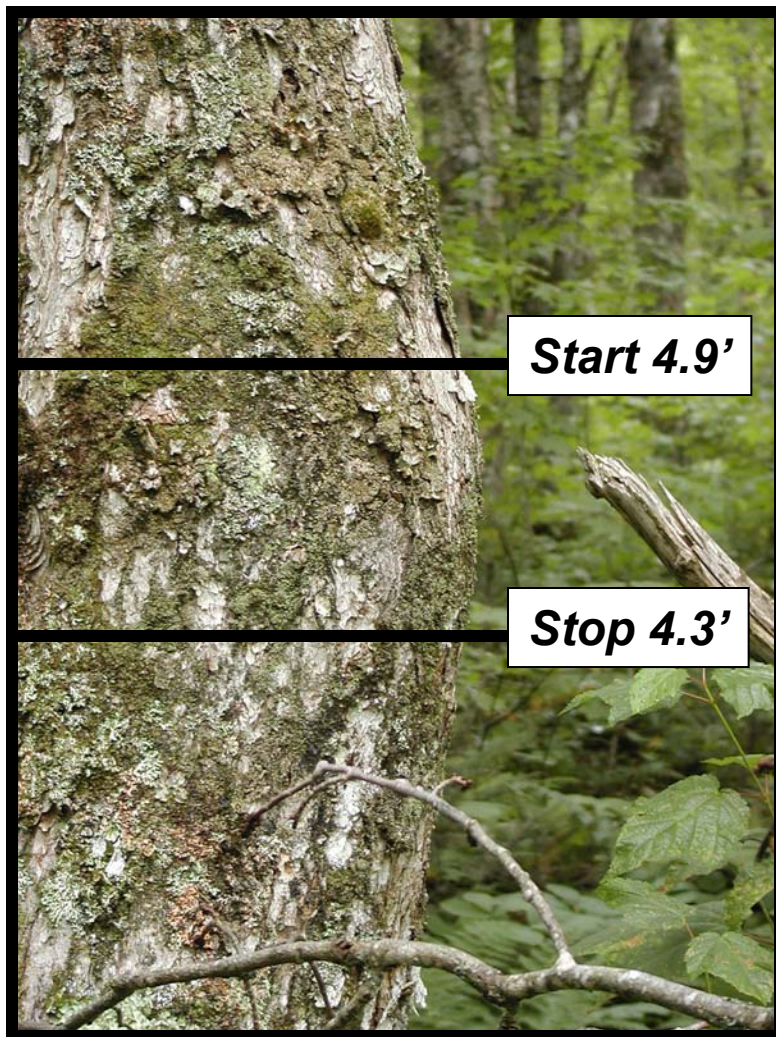
A High Bump is an abrupt protuberance on the bole of the tree with a height to length taper of 1:3 or less. High bumps on the bole indicate an overgrown limb or seam lies just below the surface. High bumps are always a grade defect and clear cuttings are not permitted from the affected area. Stop clear cuttings where the rise starts and start clear cuttings on the opposite side of the bump where the bole returns to normal.

Grade Defect – Bump (Medium)



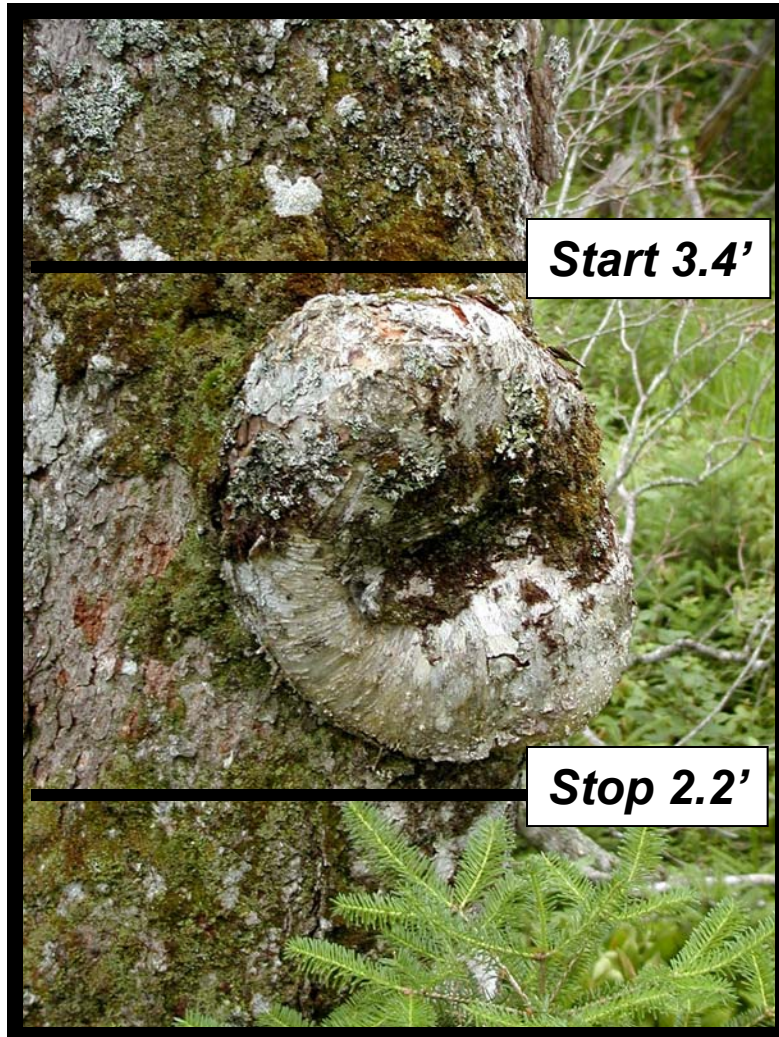
A Medium Bump is an abrupt protuberance on the bole with a height to length taper of 1:6 to 1:3. A medium bump indicates a defect that has begun to grow over. Because the defect is further below the surface than with a high bump, clear cuttings can enter into the bump for 1/8 of its length on either side. For example, if the bump starts at 8.2' and stops at 9.0', the stop and start for clear cuttings would be 8.3' and 8.9'.

Grade Defect – Bump (Low)



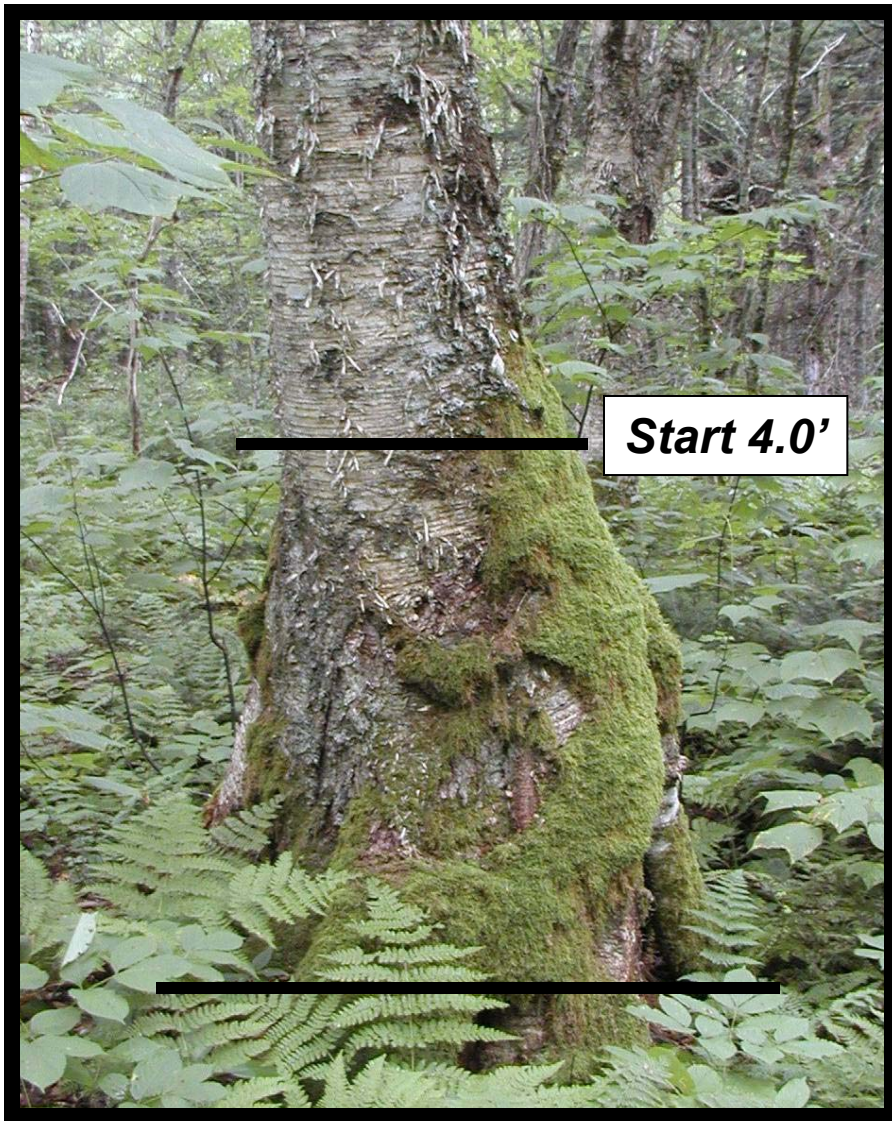
A Low Bump is a protuberance on the bole with a height to length taper of 1:12 to 1:6. A low bump indicates a defect buried deep within the bole. Because the defect is so far beneath the surface, clear cuttings are permitted to enter into the bump $\frac{1}{4}$ of its length on both sides. For example if the defect begins at 4.0' and ends at 5.2' the stop of the clear cuttings would be 4.3' and the start would be 4.9'.

Grade Defect – Burl



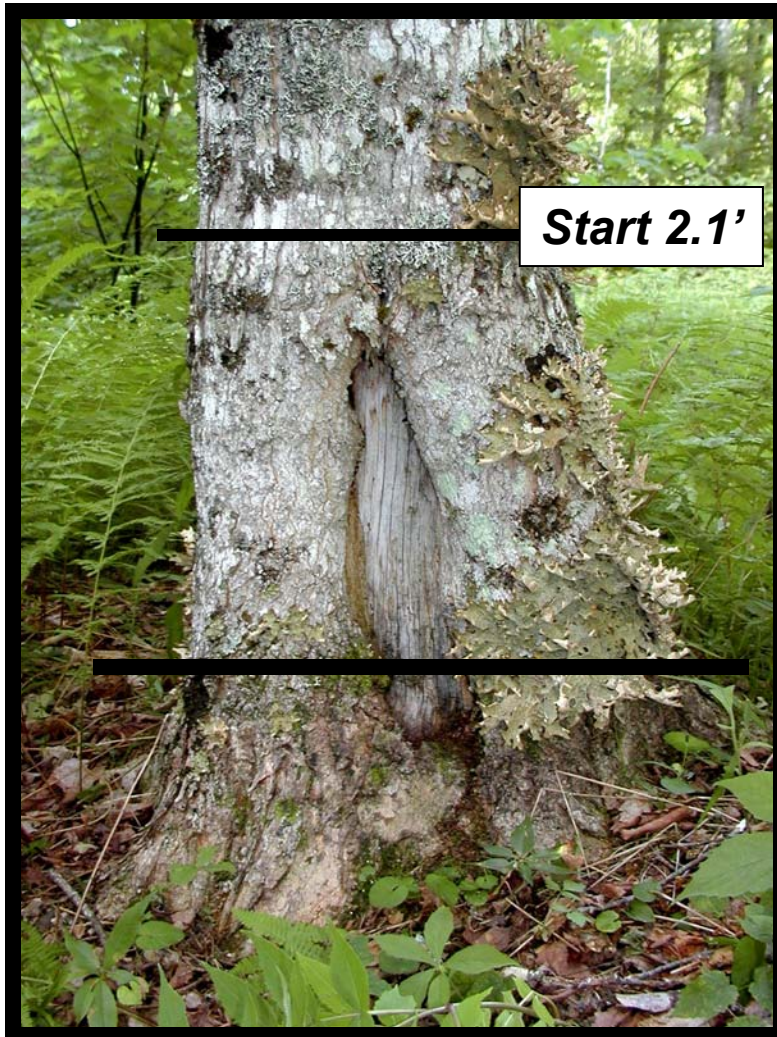
A Burl is a sound, rounded growth protruding from the bole of the tree. Because bark pockets and knots are often associated with a burl they are always a grade defect. Stop clear cuttings where the stem around the burl starts to swell and start the clear cutting on the opposite side of the burl where the swelling ends.

Grade Defect – Butt Bulge



Butt Bulges are an unusual swelling or “barreling” shape at the base of the bole. This swelling indicates internal rot. No clear cuttings are permitted from the affected portion of the grade face. Start the clear cutting where the swelling ends and the bole returns to normal form.

Grade Defect – Butt Scar



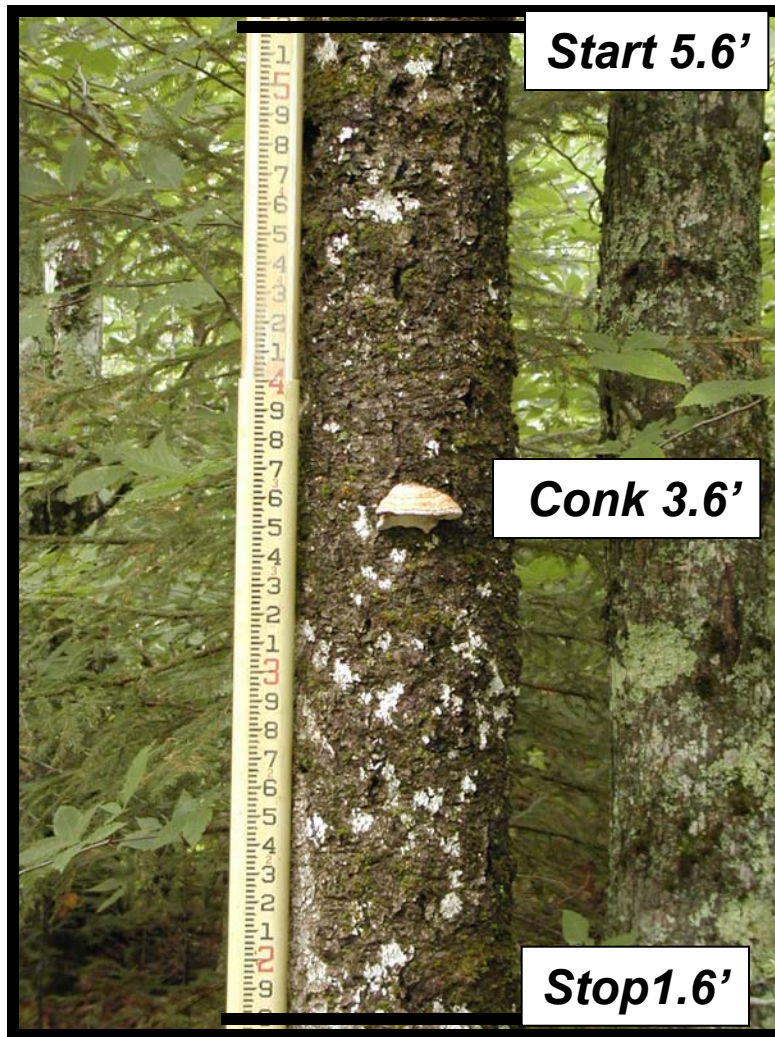
A Butt Scar is a triangular scar at the base of the bole. The scar may contain decayed wood or if advanced the wood may have rotted away leaving a hole. All butt scars are a grade defect, start clear cuttings where scar or any associated swelling ends and the bole returns to normal form.

Grade Defect - Canker



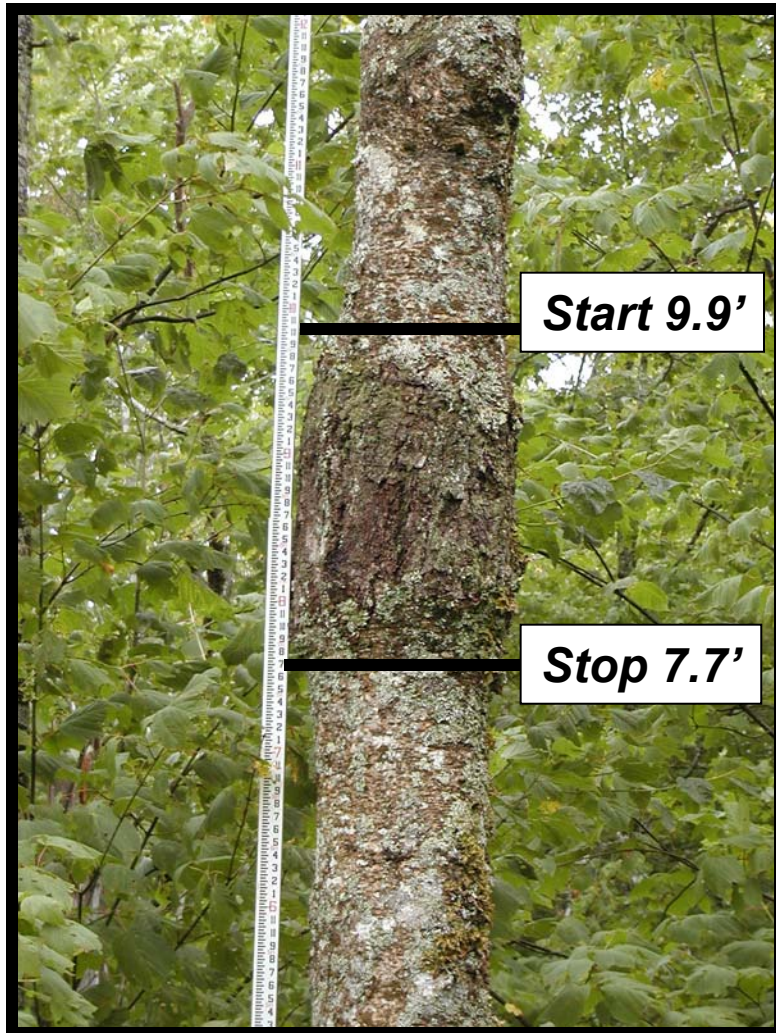
A Canker is a lesion on the bole of a tree caused by a fungus growth. The canker will cause the bole to swell and callus material will form around the defect. Stop clear cuttings where the callus material starts and resume on the opposite side of the defect where the bole returns to normal.

Grade Defect - Conk



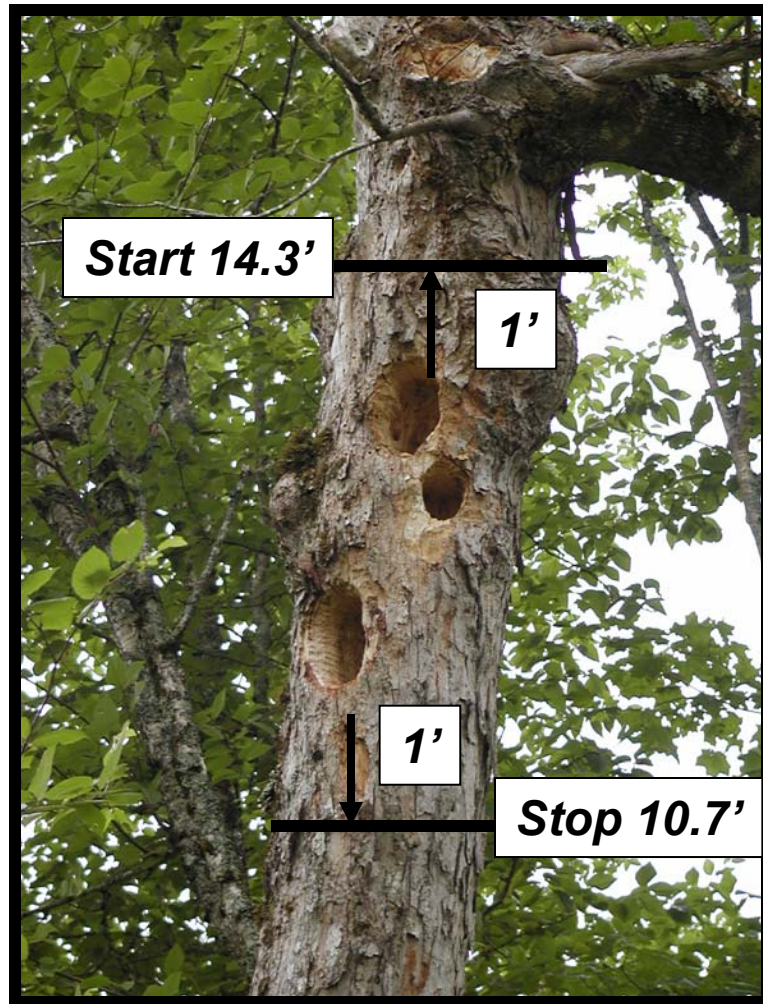
A Conk is the fibrous fruiting body of a wood-rotting fungus. The presence of a conk indicates extensive internal rot. Clear cuttings are not permitted within two feet of a conk. Stop clear cuttings 2' from the start of the conk, and resume clear cuttings 2' from the end of the conk. A conk is a grade defect on all four faces.

Grade Defect – Corky Bark



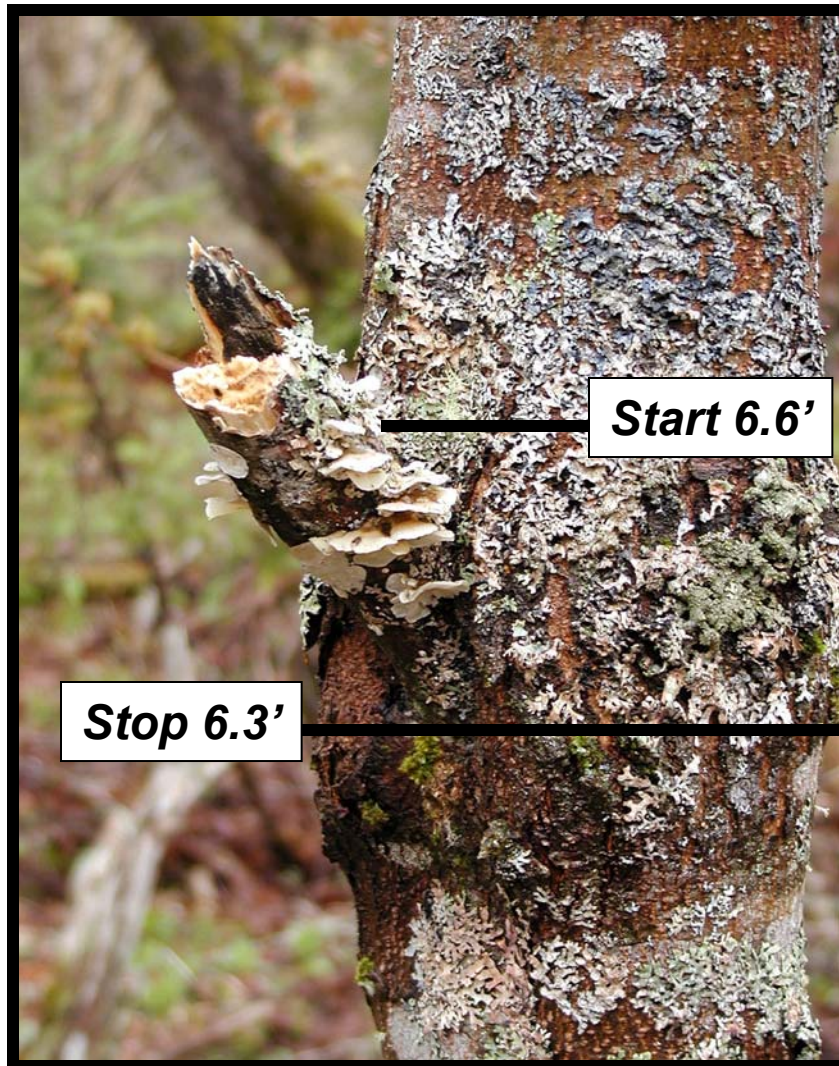
Corky Bark is a swelling of the bole covered with coarse rough bark. Clear cuttings are not permitted from the affected portion of the grade face. Stop clear cuttings where the swelling begins and resume on the opposite side of the defect where the bole returns to normal.

Grade Defect – Holes



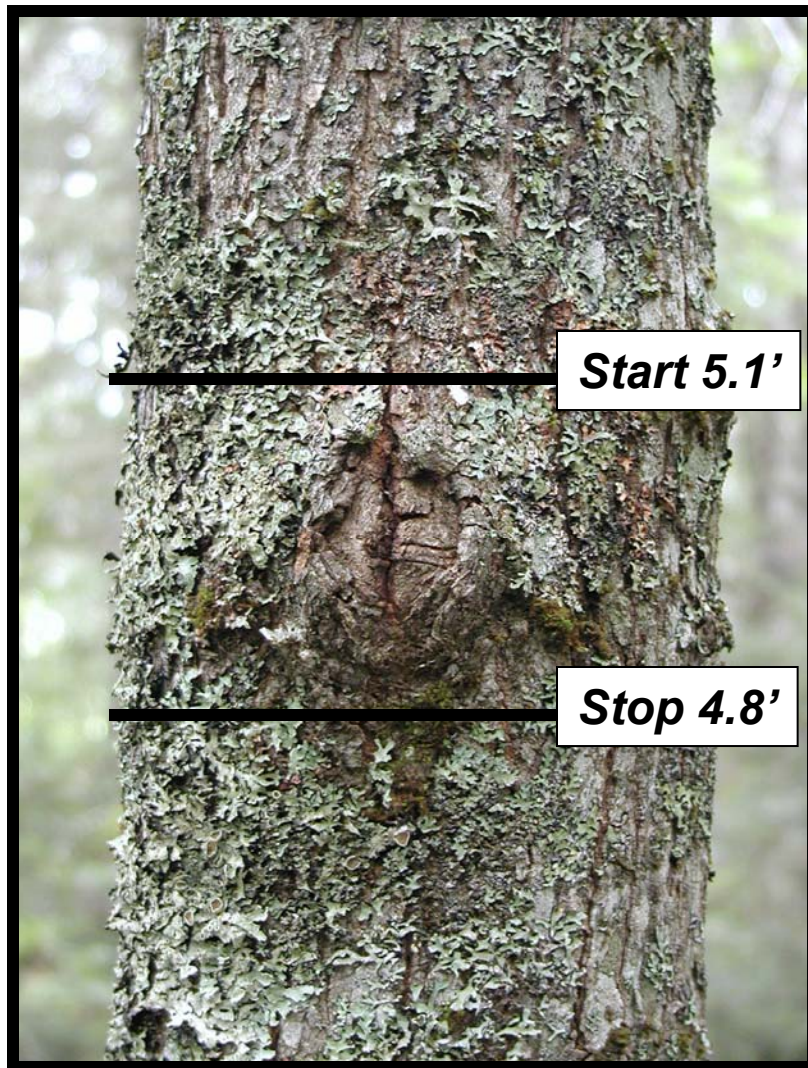
Holes are openings over $\frac{1}{2}$ " in diameter in the bole of the tree caused by rotten branches, woodpeckers or mechanical damage and are associated with internal rot or decay. Clear cuttings must be stopped and started one foot on either side of the cavity.

Grade Defect - Knots



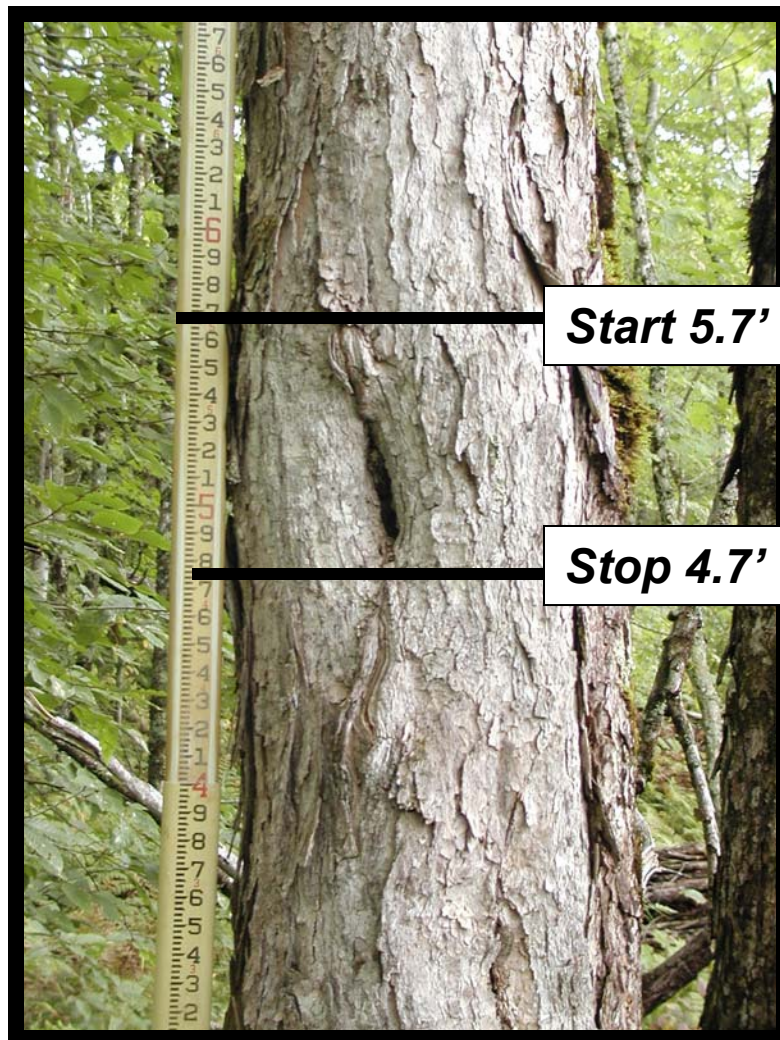
Knots are broken off branches protruding from the bole. All knots are grade defects, stop clear cuttings at the branch collar and start clear cuttings on the opposite side just above the branch collar.

Grade Defect - Overgrowths



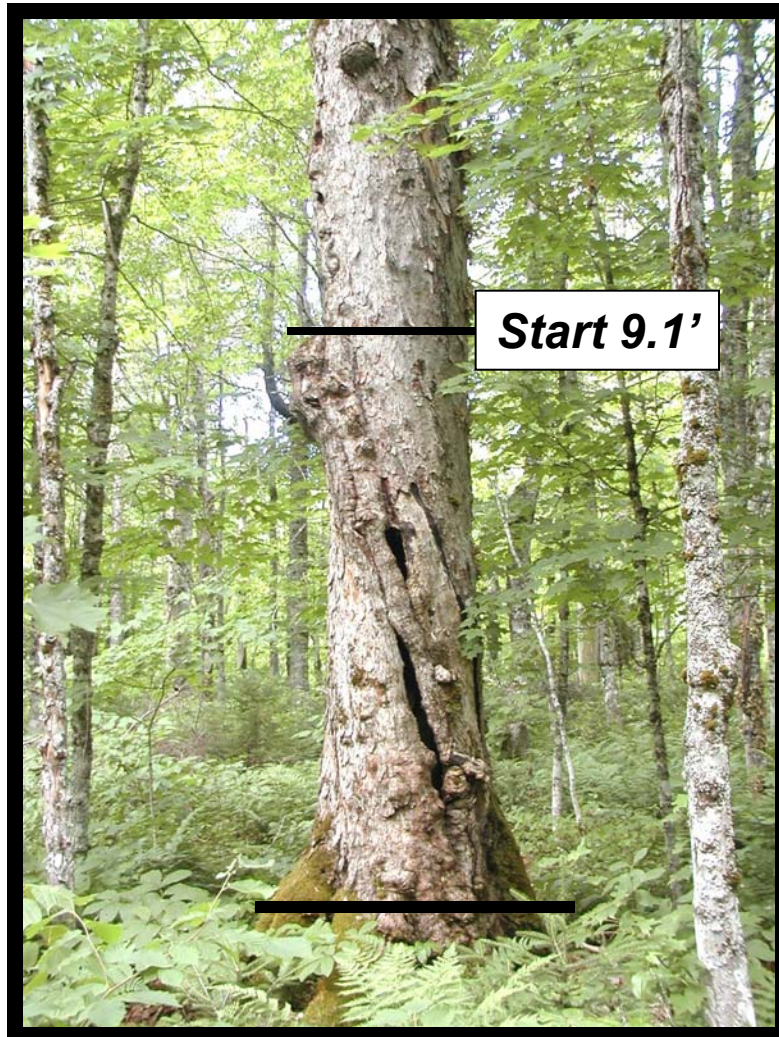
Overgrowths are overgrown knots covered with callus material. Often there are concentric circles around the defect. Overgrowths are always a grade defect, stop clear cuttings where the callus material begins and start clear cuttings on the opposite side of the defect where the callus material ends.

Grade Defect – Scars and Wounds



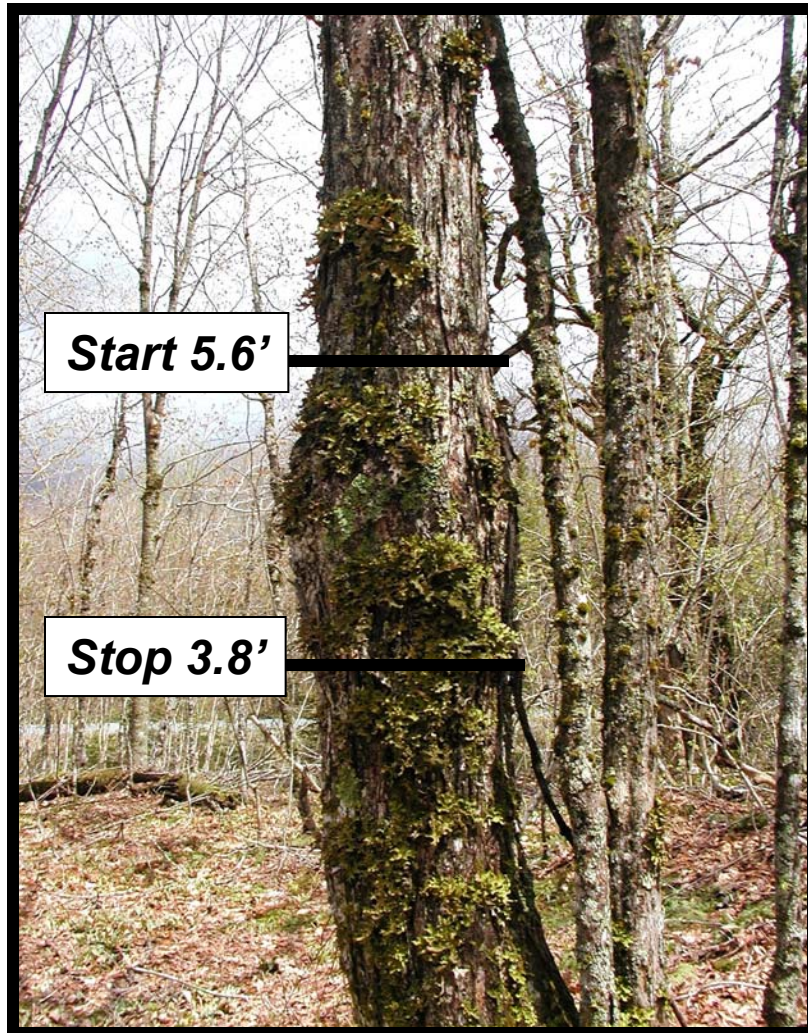
Scars and Wounds are lesions in the bark that expose the underlying wood and allow decay and stain to enter the bole. All wounds that expose the underlying wood and show evidence of rot or stain are a grade defect. Stop clear cuttings where the defect or any associated swelling begins and start clear cuttings on the opposite side of the defect where the bole returns to normal form.

Grade Defect – Spiral Seam



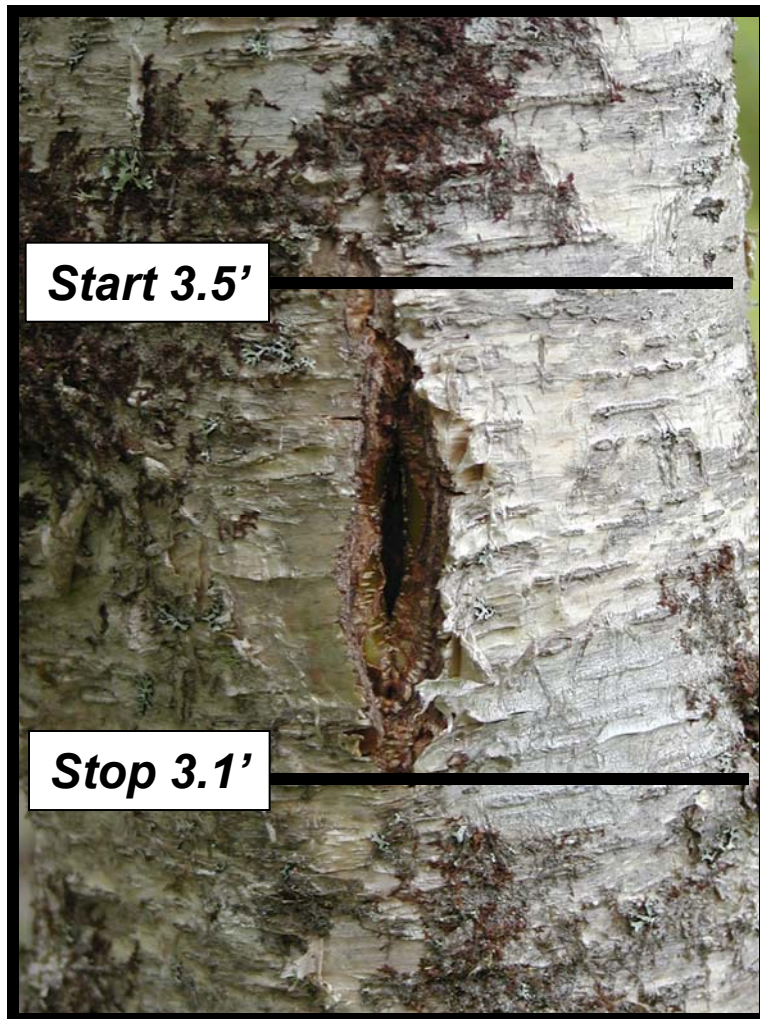
A Spiral Seam is a seam greater than 2" in depth that extends to two or more faces of the grading section. Stop clear cuttings where the seam enters the grade face and start clear cuttings where the seam exits the grade face.

Grade Defect – Stem Bulge



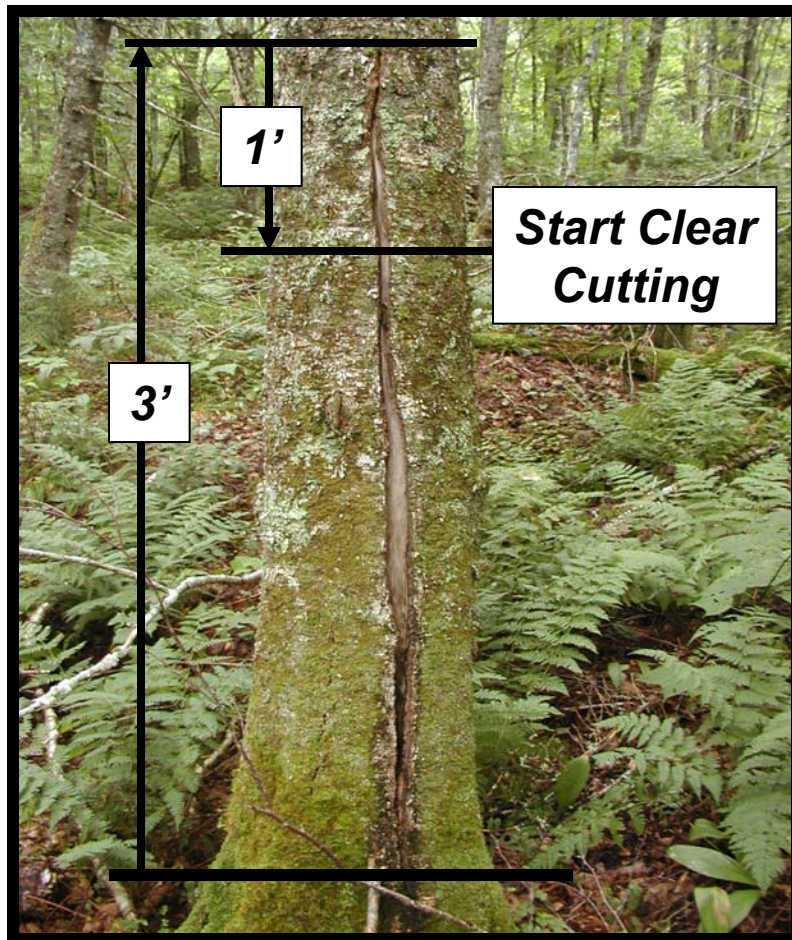
A Stem Bulge is an enlargement of the bole that begins at least 2' above stump height. The swelling indicates extensive internal rot. Stem Bulges are a grade defect on all faces and clear cuttings are not permitted from the affected area. Stop clear cuttings where the swelling begins and start clear cuttings on the opposite side of the defect where the bole returns to normal form.

Grade Defect – Stem Lesion



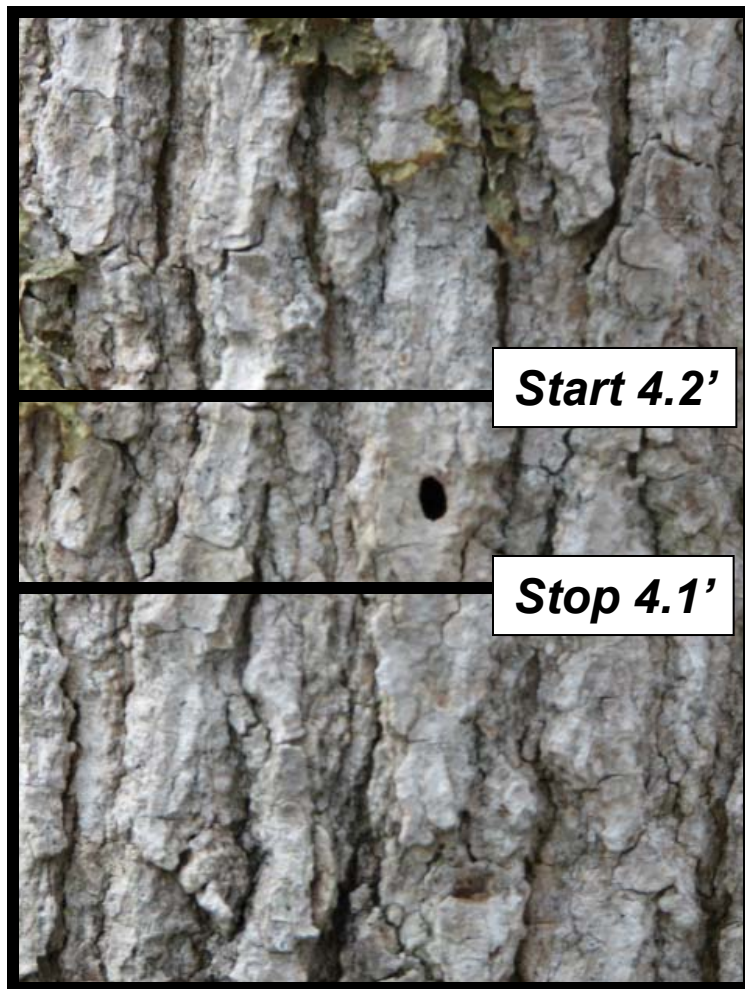
A Stem Lesion is a vertical slit in the bark from 2 to 5 inches in length. The cause is unknown. Because stem lesions contain bark and callus material they are always a grade defect. Stop clear cuttings where the callus material around the defect begins and start clear cuttings where the bark pattern returns to normal.

Grade Defect – Straight Seam



A Straight Seam is a longitudinal split in the bole of the tree, greater than 2" in depth. The seam will be confined to the grading face and can be open or closed. For straight seams that extend the full length of the grading section, no clear cuttings are permitted. If the seam extends only part of the length of the grading section, 1/3 of its length may be included in the clear cuttings. If the seam does not reach either end of the grading section, 1/4 of the length on both ends of the seam may be included in the clear cuttings.

Grade Defect – Worm Holes



Worm Holes are bore holes in the bole of the tree caused by boring insects. They can appear as a single round hole, a series of small holes or be accompanied by a callus scar as is the case with the maple borer. All insect bore holes are a grade defect. Stop clear cuttings where the insect hole or any associated callus material begins and start clear cuttings on the opposite side of the defect where the bark pattern returns to normal