

Table A5-1. Free growing damage criteria for even-aged (age class 1) coniferous trees

PLEASE READ the preceding introduction before using the following table and figures.

Location of damage	Type of damage	Tree being assessed is UNACCEPTABLE if:	Host species	Likely damage agents & damage agent codes	Comments
Stem	Wound (including sunscald and girdling)	<ul style="list-style-type: none"> the tree has any wound which is greater than 33% of the stem circumference, or the tree has a wound which is greater than 20% of the total length of the stem, or the tree has a wound centred on an infection caused by a stem rust, canker, or dwarf mistletoe (See Note under Stem: Infection). 	All	squirrel AS, beaver AZ, vole AV, porcupine AP, hare AH, Warrens root collar weevil IWW, sequoia pitch moth ISQ, fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TM, root collar weevil IWW.	A wound is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable. See Figure A5-1.
Stem	Insect mining at root collar	<ul style="list-style-type: none"> the tree is currently attacked by a bark-mining insect such as a weevil or a beetle and exhibits symptoms such as foliage discoloration, thinning, and/or reduced height growth increments 	Pl, Sx		Only trees that are symptomatic should be checked for insect infestation or mining damage. Non-symptomatic trees are presumed to be unaffected by insect mining.
Stem	Deformation (including crook, sweep, fork, browse, and dead or broken top)	<ul style="list-style-type: none"> the pith is horizontally displaced more than 30 cm from the point of defect and originates above 30 cm from the point of germination. the tree leader has been killed three or more times in the last five years (weevil only). the tree has two or more leaders with no dominance expressed after five years growth and the fork originates above 30 cm from the point of germination. the tree has a dead or broken top at a point that is >2 cm (>3 cm for the coast) in diameter. 	For sweep, all except Cw and Hw Sx, Ss, Pl All All	Defoliators ID, white pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP, northern pitch twig moth ISP, sequoia pitch moth ISQ, cattle AC, deer AD, elk AE, moose AM, frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TM. White pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP. terminal weevils (IWS, IWP), frost NG, animal damage A.	For horizontal displacement see Figure A5-2. This criterion applies only for terminal weevil damage. Leader dominance occurs when the tallest leader is at least 5 cm taller than the second tallest leader. See Figure A5-3.
Stem	Infection (including cankers and galls)	<ul style="list-style-type: none"> any infection occurs on the stem. 	All	comandra blister rust DSC, stalactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG, atropellis canker DSA.	Note: Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.
Branch	Infection (cankers)	<ul style="list-style-type: none"> an infection occurs on a live branch less than 60 cm from the stem. 	Pw, Pl, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS.	See Figure A5-4.
Branch	Galls	<ul style="list-style-type: none"> a gall rust infection occurs on a live branch less than 5 cm from the stem. 	Pl, Py	western gall rust DSG.	See Figure A5-4.

Table A5-1. Continued

Location of damage	Type of damage	Tree being assessed is UNACCEPTABLE if:	Host species	Likely damage agents & damage agent codes	Comments
Branch	Gouting	<ul style="list-style-type: none"> any adelgid gouting occurs on a branch. 	Ba, Bg, Bl	balsam woolly adelgid IAB.	Gouting is defined as excessive swelling of a branch or shoot caused by balsam woolly adelgid, and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.
Foliage	Defoliation	<ul style="list-style-type: none"> >80% of tree foliage has been removed due to defoliating insects or foliage disease. 	All	defoliators ID, foliage diseases DF.	
Stem or Branch	Dwarf mistletoe infection	<ul style="list-style-type: none"> any infection occurs on the stem or a live branch, or a susceptible tree is located within 10 m of an overtopping tree, which is infected with dwarf mistletoe. 	Hw, Pl, Lw, Fd	hemlock dwarf mistletoe DMH, lodgepole pine dwarf mistletoe DMP, larch dwarf mistletoe DML, Douglas-fir dwarf mistletoe DMF.	Note: To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms. Overtopping tree is a tree that is three or more times taller than the median height of the trees being assessed.
Roots	Root disease	<ul style="list-style-type: none"> sign(s) or a definitive combination of symptoms of root disease are observed. infected tree found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRA is two, except in BEC zones PPdh1 and 2, IDFxh1, IDFdm1 and 2, MSdk1, and MSdm1 where the multiplier is one. 	All	<p>armillaria root disease DRA, laminated root rot DRL, tomentosus root rot DRT, annosus root disease DRN, blackstain root disease DRB.</p> <p>armillaria root disease DRA.</p>	<p>Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs.</p> <p>Symptoms include foliar chlorosis or thinning, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. An individual symptom is not sufficient to identify a root disease.</p> <p>Note: All conifer species are considered susceptible. Broadleaf species are considered not susceptible for survey purposes only.</p> <p>Example: How to apply net down for root disease. If root disease-infected trees are found in the plot: 1. In the first sweep, determine the total number of healthy, well-spaced trees using the prescribed minimum inter-tree distance (MITD) (e.g., 12 trees) ignoring the M-value; 2. In a second independent sweep, determine the number of well-spaced infected trees (including dead infected trees and for DRT only, infected stumps) using MITD (e.g., one infected tree); 3. Multiply the number from step 2 by the multiplier for the specific root disease and subtract this number from the number of susceptible healthy well-spaced trees found in step 1 (e.g., for DRA: $12 \cdot 1(2) = 10$). The result is the maximum number of free growing trees tallied for the plot.</p> <p>Note: Bl, Cw, Pl, Pw, Py, and broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: Ba, Bl, Cw, Fd, Pl, Pw, Py and broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: Bg, Bl, Cw, Cy, Fd, Hm, Pl, Pw, Py, Sx and broadleaf species are considered not susceptible for survey purposes only.</p>
		<ul style="list-style-type: none"> infected conifer found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRL is four. infected conifer or stump found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRT is two. infected conifer found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRN is two. 	Fd, Sx, Se Lw, Ba, Bg Se, Sx Ba, Hw, Ss	<p>laminated root rot DRL.</p> <p>tomentosus root rot DRT.</p> <p>annosus root rot DRN.</p>	

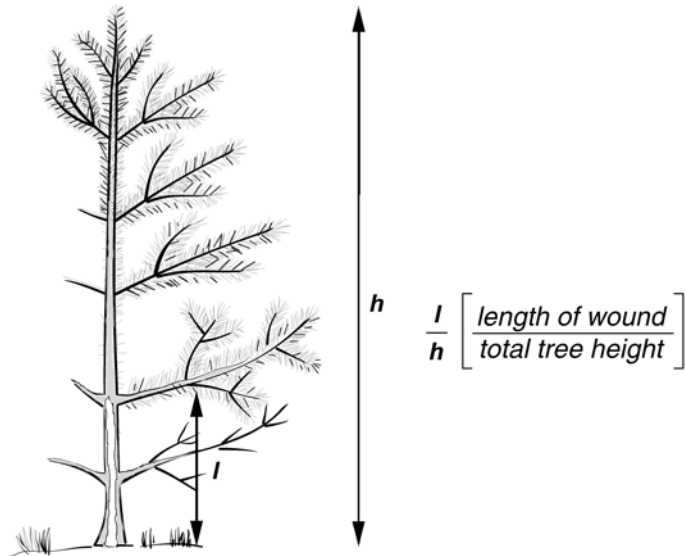


Figure A5-1. Calculation of wound along stem length.

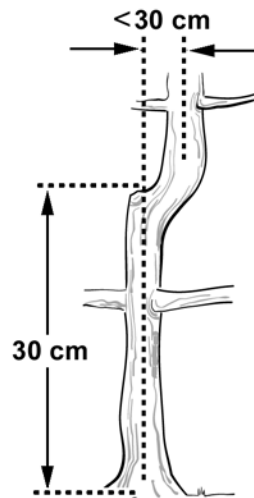


Figure A5-2. Determining horizontal displacement and height above point of germination when assessing stem deformation.

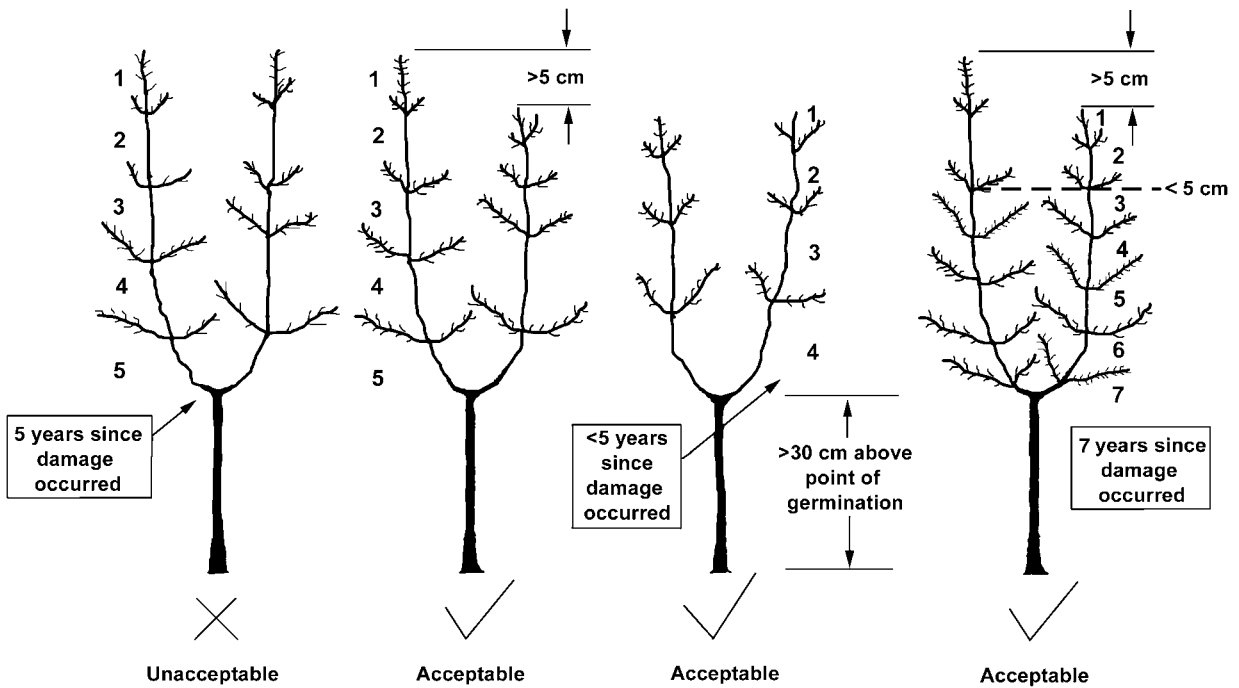


Figure A5-3. Acceptable and unacceptable forks.

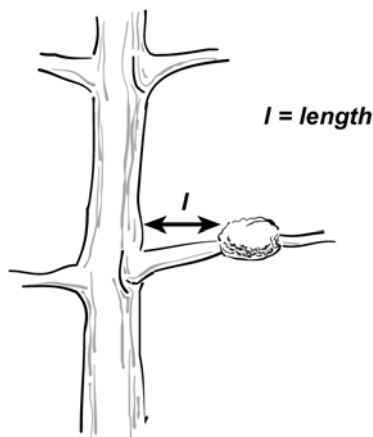


Figure A5-4. Distance measurement from point of infection by canker or gall to main stem.

Definitions

decay: the disintegration of plant tissue. The process by which sound wood is decomposed by the action of wood-destroying fungi and other microorganisms.

fork: two or more leaders have originated from the loss of a leader or apical shoot. At free growing age, a fork is considered persistent if it has not differentiated in height between competing leaders by more than 5 cm after five years of growth since the leader damage occurred. Forks may provide entry points for decay fungi, are points of weakness during felling, and may create waste in the highest value first log.

gall: nodule or lump of malformed bark or woody material caused by a variety of damaging agents, such as western gall rust and some insects.

gouting: excessive swelling of a branch or shoot, often accompanied by misshapen needles and buds. Most common at nodes on branches and frequently caused by balsam woolly adelgid on true firs (*Abies* spp.).

infection: characterized by a lesion or canker on stem or branches or by swelling around the entrance point of a pathogen.

injury: damage to a tree by a biological, physical, or chemical agent.

scar: a wound completely healed over with callus tissue

wound: an injury where cambium is dead (e.g., sunscald) or completely removed. Wounds often serve as entry points for decay fungi.