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Forest Service  
per RM-92A

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Rocky Mountain Forest and  
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Fort Collins, Colorado

**PARTIAL CUTTING**  
**PRACTICES IN**  
**OLD-GROWTH**  
**LOGSPOLE PINE**

A Field Guide

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## INTRODUCTION

This field guide was prepared to aid the forest manager in identifying different stand conditions and developing partial cutting practices needed to maintain permanent forest cover. Detailed information on tree and stand characteristics, windfall risk, insect and disease susceptibility, and cutting practices to integrate timber production with other uses is given in USDA Forest Service Research Paper RM-92, "Partial Cutting Practices in Old-Growth Lodgepole Pine."

## WINDFALL RISK SITUATION

### A. LOW RISK

1. Valley bottoms except where parallel to the prevailing winds, and all flat areas.
2. All lower and gentle middle north- and east-facing slopes.
3. All lower and gentle middle south- and west-facing slopes that are protected by considerably higher ground not far to windward.

### B. MODERATE RISK

1. Valley bottoms parallel to the direction of prevailing winds.
2. All lower and gentle middle south- and west-facing slopes not protected to the windward.
3. Moderate to steep middle and all upper north- and east-facing slopes.
4. Moderate to steep middle south- and west-facing slopes protected by considerably higher ground not far to windward.

### C. HIGH RISK

1. Ridgetops.
2. Moderate to steep middle south- and west-facing slopes not protected to the windward and all upper south- and west-facing slopes.
3. Saddles in ridgetops.

The risk of windfall in these situations is increased at least one category by such factors as poor drainage, shallow soils, and defective roots and boles. All situations become high risk if exposed to special topographic situations such as gaps and saddles in ridges at higher elevations to the windward that can funnel wind into the area.

# MISTLETOE RATING SYSTEM

## INSTRUCTIONS

STEP 1. Divide live crown into thirds.

STEP 2. Rate each third separately.

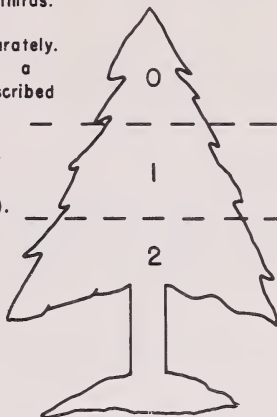
Each third should be given a rating of 0, 1 or 2 as described below.

(0) No visible infections.

(1) Light infection (1/2 or less of total number of branches in the third infected).

(2) Heavy infection (more than 1/2 of total number of branches in the third infected).

STEP 3. Finally, add ratings of thirds to obtain rating for total tree.



## EXAMPLE

If this third has no visible infections, its rating is (0).

If this third is lightly infected, its rating is (1).

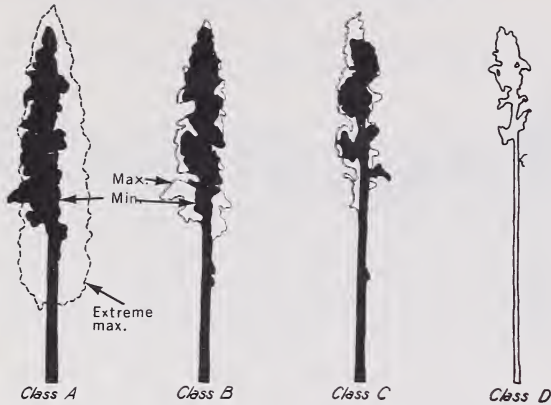
If this third is heavily infected, its rating is (2).

The tree in this example will receive a rating of  $0 + 1 + 2 = 3$ .

The average stand rating can be estimated by determining the percentage of trees infected in the stand. The approximate relationship of average stand rating to proportion of trees infected in mature stands is shown below:

<u>Average stand mistletoe rating</u>	<u>Percent of trees infected</u>
1	50
2	70
3	90
4	97
5	99
6	100

## TREE VIGOR CLASSES



### A. VIGOR CLASS A

1. Crown area: 30 percent or more of the "extreme outline" of vigor class A.
2. Crown length: 50 percent or more of the bole length.
3. Crown vigor: Dense, full, good color, pointed.

### B. VIGOR CLASS B

1. Crown area: Usually more than 30 percent but less than 50 percent of the "extreme outline" of vigor class A.
2. Crown length: Usually more than 50 percent but usually less than 60 percent of the bole length.
3. Crown vigor: Moderately dense, good color, pointed or slightly rounded.

### C. VIGOR CLASS C

1. Crown area: 15 to 30 percent of the "extreme maximum" of vigor class A.
2. Crown length: 40 to 50 percent of the bole length except for trees with above-average vigor when 20 percent of the bole length is sufficient.
3. Crown vigor: Sparse, bunched, poor color, never pointed.

### D. VIGOR CLASS D

1. All live trees of poorer vigor than class C. Includes trees in classes A, B, and C outlines but with dead or dying tops.

# SINGLE-STORY



## A. STAND DESCRIPTION

1. May appear to be even-aged, but often contains more than one age class, occasionally may even be broad-aged.
2. Codominants form the general level of the canopy, but the difference in height between dominants, codominants and intermediates is not as great as in spruce-fir stands.
3. If even-aged in appearance: (a) There is a small range in diameter classes and crown length. (b) Live crown length of dominants and codominants is generally short to medium (30 to 60 percent of the total tree height and boles are generally clear for 10 to 40 percent of total tree height). (c) There are few coarse-limbed trees in the stand.
4. With two or more age classes, the younger trees usually have finer branches, smaller diameters, longer live crown and less clear bole than older trees.
5. Stocking is generally uniform.
6. Usually does not have a manageable stand of advanced reproduction.
7. In mixed stands, the overstory is either (a) pure pine or (b) pine and Engelmann spruce, subalpine fir or Douglas-fir, with advanced reproduction of species other than pine that may or may not be a manageable stand.



## B. SUGGESTED CUTTING PRACTICES

These stands are usually the least windfirm because the trees have developed together over long periods of time and mutually protect each other from the wind.

### 1. Low windfall risk situations

- a. The first cut can remove about 30 percent of the basal area on an individual tree basis. This first entry is an intermediate cut that resembles the first step of a three-cut shelterwood since it probably does not open up the stand enough for pine reproduction to become established in significant numbers. Overstory trees are all about equally susceptible to blowdown, therefore, the general level of the canopy should be maintained by removing some trees in each overstory crown class. The cut should come from C and D vigor class trees, but avoid cutting openings larger than one tree height in diameter by distributing the cut over the entire area. In mixed stands, if the overstory is pure pine, handle as a pure stand, but if the overstory is of mixed composition, cut as much of the pine as possible (without exceeding the percentage of basal area recommended) to release the climax species.
- b. The usual uniform arrangement of individual trees in single-storied stands is not well adapted to removing trees by group selection cutting. Occasionally, however, natural openings do occur when stands begin to break up. Furthermore, small openings may be desirable to meet management objectives. An alternative to removing trees on an individual basis would be to remove about 30 percent of the basal area in groups. Openings should be kept small--not more than 1 to 2 times tree height in diameter--and not more than one-third of the area should be cutover at any one time. This kind of cutting should be used only in stands where insect and disease problems are minimal.

### 2. Moderate windfall risk situations

- a. The first cut should be limited to a light intermediate cutting that removes about 10 to 20 percent of the basal area on an individual tree basis. The objective is to open up the stand enough to allow the remaining trees to develop windfirmness, but provision should be made to salvage blowdowns. This type of cutting resembles a sanitation cut in that the lowest vigor and poorest risk trees should be removed, but it is important that the general level of the overstory canopy be maintained intact. Mixed stands should be handled the same as in low wind risk situations, except that less basal area will be removed.

### 3. High windfall risk situations

- a. The choice is limited to removing all trees or leaving the stand uncut. Cleared openings can be up to about 5 acres interspersed with uncut areas. Cutover areas should not exceed about one-third of the total.

## TWO-STORY



### A. STAND DESCRIPTION

1. May appear to be two-aged, but can contain more than two age classes.
2. Top story--dominants, codominants and intermediates resembles a single-storied stand.
3. Second story is composed of younger trees of smaller diameter--small saw logs, poles or saplings--than top story, but is always below and clearly distinguishable from the overstory. Trees in the second story are overtopped but may not be suppressed.
4. If more than two-aged, the overstory usually contains at least two age classes. The younger trees are finer limbed and may be smaller in diameter than the older trees. Second story may also contain more than one age class.
5. Stocking of overstory may be irregular, but overall stocking is usually uniform.
6. Usually does not have a manageable stand of advanced reproduction.
7. In mixed stands, overstory is usually pure pine, but occasionally may be pine and spruce or Douglas-fir. Second story is usually spruce and fir at higher elevations and Douglas-fir at lower elevations.
8. Stocking in mixed stands may vary from uniform to irregular.
9. Mixed stands often have a manageable stand of advanced reproduction of species other than pine.

## B. SUGGESTED CUTTING PRACTICES

Trees in the top story are usually more windfirm than those in a single-storied stand. Trees in the second and third stories are usually less windfirm than trees in the top story.

### 1. Low windfall risk situations

- a. The first cut can remove up to 40 percent of the basal area in three-storied stands (providing not more than half of the basal area removed comes from the top story). This cutting is as heavy as the first or regeneration cut of a two-cut shelterwood, but marking follows the rules for individual tree selection. Trees removed should be in vigor classes C and D insofar as possible, but since the top story is likely to be more windfirm, selected dominants and codominants should be left even when they are in vigor classes C and D, if they do not have dead or dying tops. Avoid cutting holes in the canopy larger than one tree height in diameter by distributing the cut over the entire area. In mixed stands, if the top story or the first and second stories are pure pine, handle as a pure stand. If the top story is of mixed composition, cut as much of the basal area to be removed in pine as is possible and release the climax species, but do not cut all of the pine if it is needed to maintain the overstory.
- b. In pure or mixed stands with irregular stocking, an alternative first cut can remove about 40 percent of the basal area in a modified group selection. The group openings can be larger (2 to 3 times tree height) than in single-storied stands, but the area cutover should not exceed about one-third of the total. Openings should be irregular in shape without wind-catching indentations in the borders. This kind of cutting is not applicable in pure stands where mountain pine beetle or dwarf mistletoe impose limitations because the interval between initial cutting and final harvest is likely to be too long to prevent serious mistletoe infection of new reproduction and/or loss of beetle-susceptible trees.

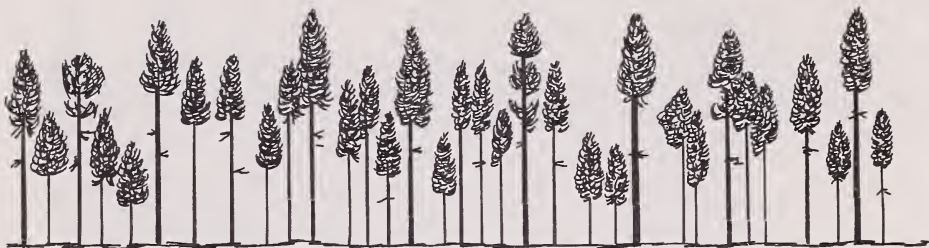
### 2. Moderate windfall risk situations

- a. The first cut should be an intermediate harvest that removes not more than 30 percent of the basal area on an individual tree basis. Predominants, and codominants and intermediates with long live crowns should be removed. Maintain the general level of the canopy by not cutting holes larger than one tree height in diameter in the canopy. Provision should be made to salvage blowdowns. Mixed stands should be handled as in low wind risk situations except that less basal area will be removed.

### 3. High windfall risk situations

- a. The choice is limited to either removing all the trees or leaving the stand uncut. Cleared openings can be up to about 5 acres, interspersed with uncut areas. The cutover area should not exceed about one-third of the total.

## THREE-STORY



### A. STAND DESCRIPTION

1. May appear three-aged; can contain more than three age classes, but is seldom broad-aged.
2. Top story resembles a single-storied stand except that there are fewer trees.
3. Second and third stories consist of younger, smaller diameter trees. Second story may be small saw logs or large poles, while the third story is like to be composed of small poles or saplings. Second and third stories are overtopped, and some trees may be suppressed.
4. Overall stocking is likely to be uniform, but stocking of any story may be irregular.
5. Usually does not have a manageable stand of advanced reproduction.
6. In mixed stands the top story may be either pure pine or a mixture of pine and other species. Second story is usually spruce and subalpine fir at higher elevations, or Douglas-fir at lower elevations. May occasionally contain some pine, but is rarely pure pine. Third story is almost always composed of species other than pine.
7. Stocking in mixed stands can vary from uniform to irregular.
8. Mixed stands often have a manageable stand of advanced reproduction of species other than pine.

## B. SUGGESTED CUTTING PRACTICES

Trees in the top story are usually more windfirm than those in a single-storied stand. Trees in the second story are usually less windfirm than trees in the top story.

### 1. Low windfall risk situations

- a. The first cut can remove up to 50 percent of the basal area in two-storied stands (providing not more than half of the basal area removed comes from the top story). This cutting is as heavy as the first or regeneration cut of a two-cut shelterwood, but marking follows the rules for individual tree selection. Trees removed should be in vigor classes C and D insofar as possible, but since the top story is likely to be more windfirm, selected dominants and codominants should be left even when they are in vigor classes C and D, if they do not have dead or dying crowns. Avoid cutting holes in the canopy larger than one tree height in diameter by distributing the cut over the entire area. In mixed stands, if the top story or rarely the first and second stories are pure pine, handle as a pure stand. If the top story is of mixed composition, cut as much of the basal area to be removed in pine as is possible and release the climax species, but do not cut all of the pine if it is needed to maintain the overstory.
- b. In pure or mixed stands with irregular stocking, an alternative first cut can remove about 40 percent of the basal area in a modified group selection. The group openings can be larger (2 to 3 times tree height) than in single-storied stands, but the area cutover should not exceed about one-third of the total. Openings should be irregular in shape without wind-catching indentations in the borders. This kind of cutting is not applicable in pure stands where mountain pine beetle or dwarf mistletoe impose limitations, because the interval between initial cutting and final harvest is likely to be too long to prevent serious mistletoe infection of new reproduction and/or loss of beetle-susceptible trees.

### 2. Moderate windfall risk situations

- a. The first cut should be an intermediate harvest that removes not more than 30 percent of the basal area on an individual tree basis. Predominants, and codominants and intermediates with long live crowns should be removed. Maintain the general level of the canopy by not cutting holes larger than one tree height in diameter in the canopy. Provision should be made to salvage blow-downs. Mixed stands should be handled as in low wind risk situations except that less basal area will be removed.

### 3. High windfall risk situations

- a. The choice is limited to either removing all the trees or leaving the stand uncut. Cleared openings can be up to about 5 acres interspersed with uncut areas. The cutover area should not exceed about one-third of the total.

# MULTI-STORY



## A. STAND DESCRIPTION

1. Usually broad-aged with a wide range in diameters.
2. If stands developed from relatively few individuals following disturbance, the overstory trees are coarse-limbed. Fill-in trees are better formed and finer limbed. Vigor of overstory trees varies from poor to good.
3. In stands that developed from deterioration of single- or two-storied stands, the overstory trees may be no limbier than the fill-in trees. Nearly all of the healthy, faster growing trees are below saw log size.
4. Stocking may be irregular.
5. May have a manageable stand of advanced reproduction.
6. In a mixed stand, the overstory may be pure pine or either pine, spruce and fir at higher elevations or pine and Douglas-fir at lower elevations. Understory trees have the same characteristics as pure stands except that the composition is likely to be species other than pine.
7. Stocking in mixed stands is more likely to be irregular.
8. Mixed stands frequently have a manageable stand of advanced reproduction of species other than pine.

B. SUGGESTED CUTTING PRACTICES

These are usually the most windfirm stands, even where they have developed from the deterioration of single- and two-storied stands. By the time they have reached their present condition, the remaining overstory trees are likely to be windfirm.

1. Low to moderate windfall risk situations

- a. There is considerable flexibility in harvesting these stands. All size classes can be cut with emphasis on either the largest or smallest trees in the stand. The first cut can range from an overwood removal to release the younger growing stock to a thinning from below to improve the spacing of the larger trees. Thereafter cutting can be directed toward either even-aged or uneven-aged management. In mixed stands the first cut should be an overwood removal of the pine to release the climax species. The understory trees should be thinned to improve spacing.

2. High windfall risk situations

- a. The safest first cut is an overwood removal with a light thinning from below to obtain a wider spaced, more open stand that can develop windfirmness. Thereafter, cutting can be directed toward either uneven- or even-aged management.

A. MODIFICATION OF SUGGESTED CUTTING PRACTICES IMPOSED BY  
DISEASE AND INSECT PROBLEMS

1. Dwarf mistletoe

- a. Cut only in stands where the average mistletoe rating is 2 or less, (or less than about two-thirds of the trees are infected) and remove only the percentage of basal area recommended for the stand description and windfall situation. In single-storied stands, where site index is 70 or above, trees in the intermediate and lower crown classes should be removed in preference to dominants and codominants. If site index is below 70, trees in all crown classes are about equally susceptible to infection. In two- and three-storied, as much of the cut as possible should come from the second and third stories because these trees are likely to be more heavily infected than the top story. To minimize infection to new reproduction in single-, two- and three-storied stands, the final overstory removal should be made within 30 years after the regeneration cut when the average mistletoe rating is 1, and within 20 years when the rating is 2. Provision should be made to sanitize the young stand at the time of final harvest. In multi-storied stands, the safest procedure is an overwood removal with a cleaning and thinning from below.
- b. In old-growth stands with an average mistletoe rating of greater than 2, any partial cutting, thinning or cleaning is likely to intensify the infection. The safest procedure, therefore, is to either remove all trees and start a new stand or leave the stand uncut. If the manager chooses to make a partial cut for any reason, the initial harvest should be heavy enough to be a regeneration cut. All residual trees must be removed within 10 years after the first cut, and provision made to sanitize the young stand at that time.

2. Comandra blister rust

- a. Cut as many trees with stem cankers and spiketops as possible without removing more than the recommended basal area or cutting large openings in the canopy. Since the rate of spread in mature trees is relatively slow, and the disease is not transmitted from pine to pine, leaving a few infected trees is less of a risk than opening up the stand too much.



3. Mountain pine beetle

- a. If the insect is present in the stand at an endemic level, or in adjacent stands in sufficient numbers to make successful attacks and:
- (1) Less than the recommended percentage of basal area to be removed is in susceptible trees, any attacked tree and all of the most susceptible trees should be removed in the first cut. This will include most of the trees 14 inches d.b.h. and larger, and all trees 10 to 14 inches d.b.h. in vigor classes A and B. Provision should be made to salvage attacked trees, and a second cut should be made in about 10 years after the first cut.
  - (2) More than the recommended percentage of basal area to be removed is in susceptible trees, the manager has three options: (1) remove all the trees, (b) remove the recommended basal area in attacked and susceptible trees and accept the risk of future losses, or (c) leave the stand uncut. If the stand is partially cut or left uncut, some trees from 7 to 12 inches d.b.h. and most trees below 7 inches d.b.h. will survive all but epidemic outbreaks.
- b. If the stand is presently sustaining an infestation that is building up, and the manager chooses to either partially cut or leave the stand uncut, he must accept the risk of an outbreak that could destroy most of the merchantable stand.

