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# Forest Insect & Disease Bulletin

## Arizona State Forestry Division

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## PINE NEEDLE RAKING

There are two main reasons for removing pine needles and other dead vegetative materials which accumulate on the forest floor. One is to prevent the spread of a possible destructive fire; the other is to improve aesthetics, which is a matter of personal preference.

From a fire prevention standpoint, the needle layer (duff) found on the forest floor is not generally considered to be a significant fire threat by itself, as long as some basic fire prevention practices are implemented.

If ignition occurs, this needle layer can be a source of fire spread, but it is a light fuel which burns quickly. Its arrangement is not generally conducive to causing destructive forest fires; however, it serves as the bottom rung when considering ladder fuels. The more hazardous ignition materials consist of medium and heavy fuels (e.g., shrubs, small trees, dead and down branches and logs) which will create higher temperatures for longer durations, consequently fueling more destructive fires.

The practice of cleaning needles away from ignition sources, such as barbeque grills, propane tanks and away from structures should be the primary objective.

Raking of the entire area is **not** recommended! However, the following fire prevention measures **are** recommended:

1. Rake pine needles down to the mineral soil three (3) feet to a maximum of five (5) from structures (more removal may be needed on sloped areas). Remove additional pine needles further out if the needle layer is about six (6) inches in depth. Trees within the 0 to 30 foot zone should have needles raked 6 to 12 inches from their base.

2. Re-vegetate raked areas with native grasses and groundcovers (these plants must be maintained in a vigorous green condition during fire season, or mowed close to the ground) or plant fire-resistant shrubs and trees to reduce erosion. Hardwood trees are usually less flammable than evergreen trees. Caution: Even "fire resistant" plants will burn under the right conditions.

3. Remove needles and leaves from roof tops and rain gutters, and litter from under decks and porches.

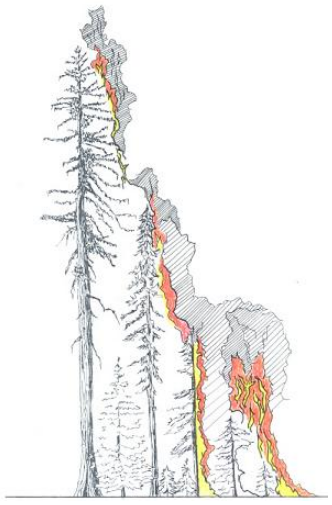
4. Properly prune overhanging green or dead branches within ten (10) feet of chimneys, stacks or incinerators. Remove overhanging green, dead or dying branches from any tree adjacent to any structure.

5. Rule of thumb: Prune pine branches up to ten (10) feet above the ground for trees over 6” in diameter, and six (6) feet above the ground for trees 6” in diameter or less. Prune trees a minimum of thirty (30) feet from structures, to prevent the fire from climbing a tree and possibly laddering up to larger trees.

6. Properly prune ponderosa pine dwarf mistletoe infested branches and/or remove heavily infested trees.

7. Remove dead and bent trees and prune dead wood and branches from shrubs. Remove small trees growing underneath larger trees; they provide ladder fuels allowing grass and needle fires to jump to the branches of larger trees, increasing fire spread.

8. Leave about fifteen (15) feet of space between shrubs and trees by thinning to help prevent fire spread. Thinning should be done for at least 100' from structures. Thinning of trees will also reduce the buildup of needles due to fewer trees and less shading, which reduces needle drop.



Ladder Fuels

9. Remove heavy fuels (e.g., dead and down branches and logs) from around structures. Within the 30 to 100 foot zone either place or leave in place a minimal amount of dead and down branches and logs to provide habitat for a variety of forest organisms.

10. Properly dispose of debris, slash and branches, especially in the spring before fire season begins. Green branches, etc., removed to reduce the fire hazard, can be mechanically chipped and added to the needle or duff layer away from structures as mulch.

From the general health and vigor of the pines and other trees in the area, raking of needles could have an adverse affect on the whole area (based on the current condition of our forests).

Several problems occur when the litter or duff is removed:

1. Nutrients generated by the decomposition of litter are no longer available to the trees, causing a possible reduction of tree growth and vigor.

2. Soil organisms (e.g., bacteria, fungi, insects, worms) critical to tree growth may be harmed.

3. Soil acidity is reduced. Pine trees usually prefer acid soils.

4. Pine needles insulate soil from extreme or rapid temperature changes, so their removal decreases the soil insulation.

5. During hot periods, exposed soils dry out quickly, reducing the uptake of moisture through the roots.

6. During wet periods, erosion may occur as a result of needle removal. Needles intercept and absorb the force of falling raindrops, thereby reducing erosion.

7. Bare soils encourage the establishment of weeds which may compete with the tree for moisture and nutrients and increase the fire hazard.

8. Soil compaction will increase, reducing the natural absorption of moisture and oxygen into the soil and roots.

If one looks at each factor singly, the impact on tree growth and vigor may not be significant; but combined, complete needle removal could in time cause the weakening of a tree, and could invite insect attacks (e.g., bark beetles). The health and vigor of a tree is its primary defense in fighting off insect attacks which quite often result in mortality.

This subject is much more complex than is described here, but this bulletin will give you an overview of things to consider.

Please check out the following links for additional information:

Firewise Communities
http://www.firewise.org/

Firewise Plant Materials for 3000' and Higher Elevations
http://www.ag.arizona.edu/pubs/natresources/az1289.pdf

The AZ Native Plant Society-Native Plant and Seed Sources
http://www.aznps.com/sources.php

Pruning Evergreens-Colorado State University Extension
http://www.ext.colostate.edu/mg/gardennotes/617.pdf

Mistletoes in Colorado Conifers-Colorado State University Extension
http://www.ext.colostate.edu/pubs/garden/02925.pdf

Management of Bark Beetles in Fuel Reduction Treatments in the Black Hills
https://sdda.sd.gov/legacydocs/Forestry/educational-information/PDF/pineengraverpiece.pdf

**For further information and technical assistance with your forest health concerns, contact:**

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