

# Pine Damage from Cotton Herbicides & Defoliant

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Image 1. Pine defoliation and needle burn from pre-plant herbicide drift in adjacent cotton field.



Image 2. Partial defoliation of pines adjacent to a cotton field. Drift from preplant application of herbicides to the cotton field caused the pine damage.

Pine plantations established on marginal agricultural lands and the acres of cotton planted have dramatically increased. Often pine stands, many established under the tree planting provisions of the Conservation Reserve Program, are adjacent to cotton fields. Pine damage caused by cotton herbicides and defoliant is becoming a common occurrence in the spring and fall. Spring season (March through May) burn-down application of herbicides such as glyphosate and paraquat are used to control herbaceous weeds prior to seeding of cotton. In the fall (September through October), defoliant including glyphosate and paraquat are used to defoliate cotton leaves as a harvest aid. Drift or over-spray of these herbicides to adjacent pines causes needle browning, partial defoliation, terminal die-back, and mortality. Fortunately, burn-down rates used for herbaceous weed control and defoliation rates are low and pines can survive if weather conditions are favorable following damage. Low vigor, over-mature trees, and newly planted seedlings may exhibit more die-back or mortality than vigorously growing sapling-sized trees.

Pines defoliated in the spring can form new foliage during the spring growth flush if the terminal buds remain alive. However, new needles formed in the spring growth flush are not replacements for the needles lost to the herbicide, so some growth reductions will occur. The growth loss and time to recovery depends on the severity of needle damage. With needle loss less than 33 percent, some volume growth loss may occur in the first growing season following damage. Needle loss of 34 to 66 percent may reduce volume growth 40 percent or less in the first growing season after damage. Severe needle loss in excess of 67 percent may reduce as much as a full year's volume growth spread over 3 years.

While damage caused in the spring can be mitigated by the normal spring growth flush, pine defoliation in the fall and early winter can dramatically increase the mortality rate, particularly on trees that were damaged in the spring. This occurs because the trees can not produce new foliage until the growth flush in the following spring forcing them to subsist for several months without a food source produced by the foliage. Unlike hardwoods, which store food reserves in their roots to sustain dormant season growth and initiate leaves in the spring, pines have limited food reserves in their stems and roots as they require year-round photosynthate production from their evergreen foliage. Often, even healthy pines die from late season defoliation.

Pine stands adjacent to cotton fields may face annual damage from herbicides and defoliant. Repeated damage to pines will reduce vigor, and growth, and increase susceptibility to pest and environmental stress. Attention to spray techniques, nozzle type, delivery pressure, wind conditions, and equipment calibration are critical in order to reduce drift and over-spray.

**Reference:** Wade, D. & J. Lundsford, 1989. A guide for prescribed fire in southern forests. USDA Forest Serv. Tech. Publ.. R8-TP 11.

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