

When is a Needle Needless?

Wood anatomy researchers study how and why evergreen trees lose their leaves

Notable notes in forest research at Oregon State University College of Forestry



As everyone knows, evergreen trees don't turn orange and gold and lose their leaves in the fall the way deciduous trees do. But even if it doesn't happen all at once, and in dramatic colors, evergreens *do* lose their foliage—the evidence is in the thick, fragrant carpet of needles beneath each pine or Douglas-fir tree.

What makes an evergreen tree lose its leaves or needles and when does it happen? Professor Barb Gartner (Wood Science & Engineering), at Oregon State University's College of Forestry, is working to find out.

She's conducting research on the way conifer needles attach to the sapwood of evergreen trees, how long they stay attached—or their longevity—and what makes them fall off. Deciduous tree leaves are attached to the growth ring for each year through an inner connection called a leaf trace. In autumn, the leaf falls, and the cambium at the base of the leaf trace becomes inactive soon afterwards.

But scientists do not fully understand how or where needles attach to the wood of evergreen trees. "We know that foliage can remain alive for many years in evergreen species, but don't know how the leaves maintain a connection with the xylem and phloem as the stem expands," Gartner says.

To try to find out, Gartner's research group is using stain and a simple suction method to examine the needle-sapwood connections on 11 different evergreen conifer species. By submerging the base of a twig in a vat of stain and then sucking through the needle tip, they've detected the pathways of water flow through the growth rings of the trees to one- and two-year-old needles. So far, they've learned that the

leaf trace attachment varies by species, as does needle longevity. The group is also

researching whether the growth ring through which stain is pulled is related to age of needles or diameter of the stem in Douglas-fir saplings. They hope to learn more about how and why needles disconnect and reconnect to different growth rings. "It's possible that the leaf trace can grow and reconnect for years, with the needle 'riding' on the outside of the bark," Gartner says.

The researchers also want to know what makes needles detach from the tree and fall. This knowledge will help scientists understand how the tree uses sapwood. It may also help lead to ways to lessen or prevent needle trace scarring in some species, which can lower the value of wood. Gartner thinks the trigger for detachment may have something to do with tree growth. "It's possible that the leaves fall off because the stem grows so much fatter radially that the needles just get popped off! Or perhaps there's a programmed needle lifespan of some sort—and once the needle reaches a certain age, it falls off. We don't know the answer yet," Gartner says, "but it's fun trying to find out!"