

# Ask A Professional

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*Landowner questions are addressed by foresters and other natural resources professionals. Landowners should be careful when interpreting answers and applying this general advice to their property because landowner objectives and property conditions will affect specific management options. When in doubt, check with your regional DEC office or other service providers. Landowners are also encouraged to be active participants in Cornell Cooperative Extension and NYFOA programs to gain additional, often site-specific, answers to questions. To submit a question, email to Peter Smallidge at [pjs23@cornell.edu](mailto:pjs23@cornell.edu) with an explicit mention of "Ask a Professional." Additional reading on various topics is available at [www.forestconnect.info](http://www.forestconnect.info)*

**Question:** How can I look at a seedling and know how much it grew in the previous year? (Dean F., WFL Chapter)

**Answer:** Knowing how much height growth occurred on a seedling or sapling in a previous year is instructive as a tool to understand environmental and biotic factors that influence tree growth. Further, one category of NYFOA's Northeast Timber Growing Contest assesses the success of regeneration by documenting height growth of seedlings and saplings.

During the summer months, trees develop buds that will expand in the following year. Buds form on the end of twigs and along the sides of the twigs. The buds that form along the side of the twig are called lateral buds. The buds that grow on the end of a twig (the distal end) are either a "true" terminal or a "pseudo" terminal bud. A pseudo terminal bud is actually a lateral bud, but occurs at the end of the twig and associated with a leaf scar and the remnant of a branch scar where the growing tip died. True terminal buds lack a subtending leaf scar, but may be accompanied by a pair of lateral buds (Figure 1). In some species, flower buds are pre-formed and may be quite large. Most species with opposite leaf arrangement, such as sugar maple (Figure 1) or ash have a true terminal and often a pair of subtending lateral buds at the end of the twig. Species with a zig-zag growth pattern of the twigs, such as elm or beech, typically have pseudo terminal buds.

For our purposes we will focus on terminal and pseudo terminal buds that elongate into the shoot that gives height growth to the seedling. Some botanists refer to these buds as "apical buds" because they occur at the apex of the

plant. These apical buds occur on the central or dominant leader. Apical buds maintain dominance over lateral branches through hormones that inhibit the ability of lateral buds to develop into branches. If the apical bud is killed, for example by the white pine weevil or deer browsing, apical dominance is lost and lateral buds develop into branches that may begin to function as branches with an apical bud (Figure 2). Terminal buds on lateral branches also elongate, but provide lateral expansion rather than vertical expansion. [Note, some authors will refer to any bud on the distal end of a twig as an apical bud.]



*Figure 1: The terminal bud and two lateral buds of sugar maple are illustrated. Note the terminal bud, a true terminal bud, is typically larger than the lateral buds. The terminal bud will elongate (unless eaten by deer or otherwise damaged) into the stem of the next growing season, including all the foliage and perhaps flowers.*

When the buds expand in the spring and the terminal bud elongates, it forms a "bud scale scar" that demarcates the position of the bud at the beginning of the growing season. The scar is a single or a series of stacked rings that encircle the twig (Figure 3). The new twig is usually of smaller diameter and a different color than the twig of the previous year (Figure 4).

The stem formed by the terminal bud is called the terminal "leader." By mid to late summer, when terminal leaders have stopped growing, it is possible to measure the distance between the terminal bud scale scar and the base of the terminal bud. The length of the twig is the extent of growth for that year. For some species, it is possible to historically recreate the growth over several recent years on the same twig.

One of the concerns with regeneration in our woodlots is the impact of deer on seedlings. Deer will browse apical and terminal buds, forcing lateral buds to assume a dominant role in the growth of the twig (Figure 5). As those lateral buds expand, they become "apical", but the form of the seedling becomes distorted. With prolonged and intense browsing the seedlings become miniature bonsai.


With practice, owners can use terminal bud scale scars to assess seedling height growth patterns. Practice sessions should start by focusing on a single species and learning how twig diameter and color differ from one growth season versus the previous growth seasons. Maples and ash are often good species for practice because the scars are prominent. White



*Figure 2: The central or apical leader of this white pine was killed by the white pine weevil. The lateral branches have each tried to assume dominance. The cluster of branches (called a whorl) on white and red pine form at a growth node and can be used to estimate annual height growth and tree age.*

pine and red pine are good also because the whorls identify the beginning of height growth for a growing season.

With sufficient practice, owners can investigate an area of their property where they can compare among species as a way to learn which are responding most favorably to sun and soil conditions. Often the shade tolerance rating of a species will be important. For example, in an area where a few scattered trees were removed for firewood, leaving small openings in

the canopy, the best growth on seedlings will be among those with better tolerance of shade. In a large canopy opening, however, the best growth will likely be on species intolerant of shade and characterized by adaptations for rapid growth in full sunlight. 

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*Figure 4: This quaking aspen twig shows a lateral branch (the vertical stem in the picture), with the new growth as light green, two stacked rings, the previous year's growth as slightly darker, also with a couple stacked rings on the base and then the main stem that is still larger and a different color. Note that in this mid-summer picture, the bud for next summer has already formed (a bit blurry) at the distal end of the lateral branch.*



*Figure 3: This sugar maple seedling illustrates the look of stacked rings as the terminal bud scale scar. Notice the change in color from the light stem of the previous year (2013) and the darker stem of the current year (2014).*



*Figure 5: Deer will nip the outer portions of twigs as winter browse. While this provides some nutrition for deer, it has a devastating impact on the growth form of seedlings. Repeated browsing, common in many woodlots, distorts seedlings and may reduce the future quality of the stem for timber production.*