



Cooperative Extension Service  
Institute of Food and Agricultural Sciences

## Where Are Tree Roots?<sup>1</sup>

---

Edward F. Gilman<sup>2</sup>

There is much speculation on the depth and spread of tree roots. Popular articles and even text books print illustrations of trees with a tap root extending deep into the soil with lateral branch roots originating all along this root. Roots are illustrated showing the lateral roots ending at the branch dripline. Fine roots are shown evenly distributed through the soil profile. Much of this information has been passed down through the decades, with little if any research to support these concepts.

Recent root excavation studies in the Environmental Horticulture Department at the University of Florida, IFAS, are beginning to suggest that a different generalized tree root model may be operating where a tap root may or may not exist, lateral roots extend far beyond the drip line, and fine roots are concentrated in the top 12 inches of soil with many in the top 2 inches. Existence of a tap root appears to be dependent on the tree species, tree age, soil profile and whether the tree was grown in the field from seed or transplanted from a nursery container. For instance, oaks will frequently develop a tap root, whereas maples often do not. The tap root can become less prominent as the tree ages and develops an extensive lateral root system. At planting, tap roots of container-grown plants are often cut, causing initiation of lateral branch roots. These roots either grow down to form multiple tap roots or stay fairly shallow, depending on soil condition. Roots grow close to the surface in soil that is highly compacted or low in oxygen content. This appears to be evident on tap-rooted and non-tap-root

species. Therefore, in urban environments, where soil is often compacted, tap roots rarely can be found.

During tree root growth trials in Florida and New Jersey, excavation of root systems revealed that tree roots grew beyond the branch drip line for all six species tested, but the lateral extent was species dependent. Green ash roots, for instance, grew from the trunk 1.7 times further than the branch spread. Southern magnolia, on the other hand, had roots out to 3.8 times the dripline. On average, tree roots spread close to 3 times the spread of the branches, so that a tree with an 8-foot branch crown spread would have a 24-foot root spread diameter.

A second way of expressing tree root extension is by showing what percentage of the roots are inside and outside of the branch drip line. For the three species studied, more than 50% of the roots were outside the dripline.

This information can assist tree managers in diagnosing tree decline and death at construction sites. A significant portion of the roots are found beyond the dripline; consequently, trees that were reportedly well protected during construction may decline or die. These findings may also influence the placement of fertilizers for shade and street trees.

- 
1. This document is ENH 137, one of a series of the Department of Environmental Horticulture, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First printed July 1987. Reviewed February 1999. Please visit the FAIRS Web site at <http://hammock.ifas.ufl.edu>.
  2. Edward F. Gilman, Professor, Plant Environment, Environmental Horticulture, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

The Institute of Food and Agricultural Sciences is an equal opportunity/affirmative action employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race, color, sex, age, handicap, or national origin. For information on obtaining other extension publications, contact your county Cooperative Extension Service office. Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Christine Taylor Waddill, Dean