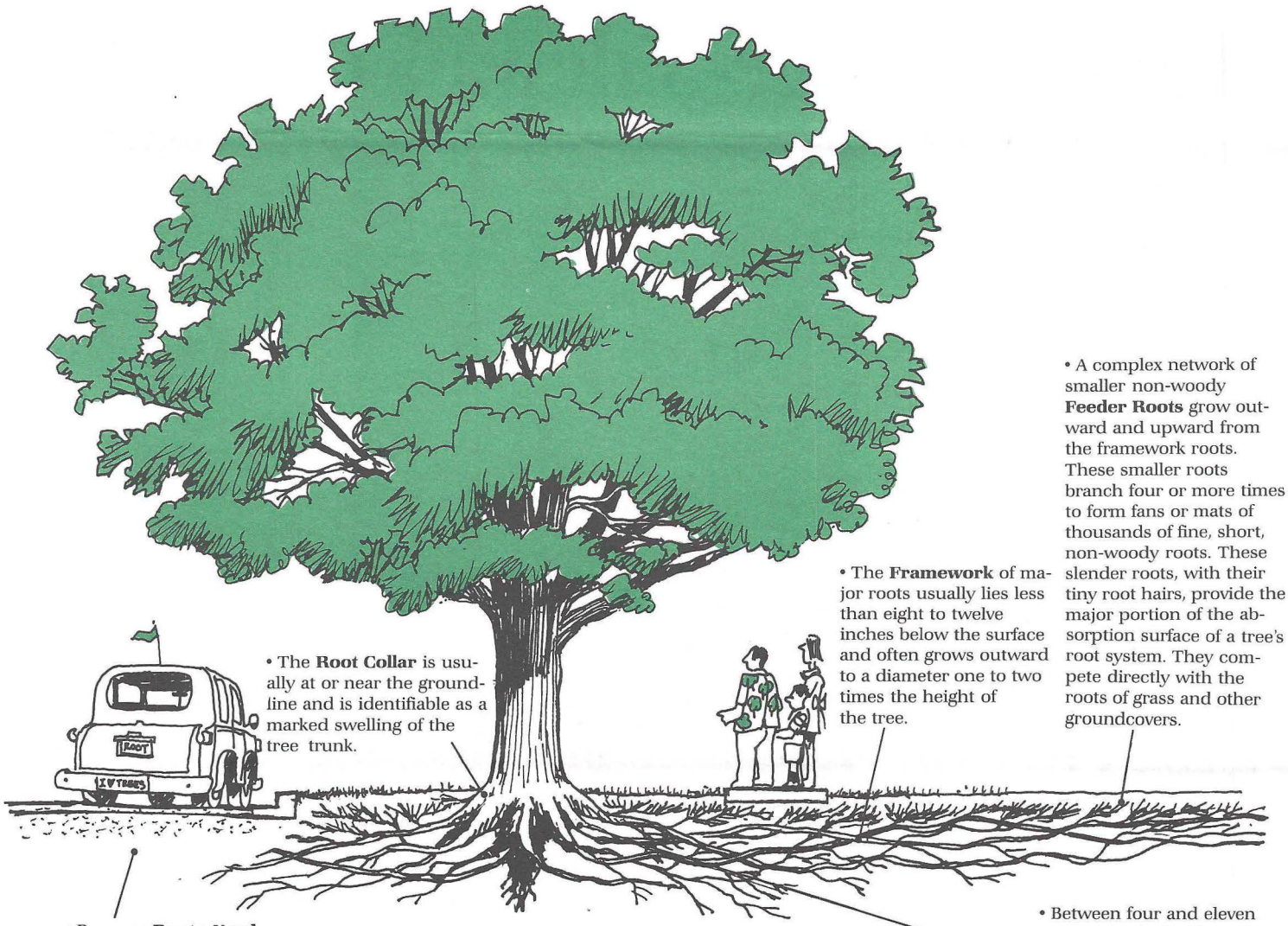
# How Roots Really Work

Tree roots are active, opportunistic extensions of the tree that provide support and supply water, oxygen, and nutrients needed to feed the tree and sustain its life. The anatomy of a tree consists of approximately 5 percent leaves, 15 percent branches, 60 percent trunk, 15 percent large transport roots, and 5 percent fine feeder roots. Roots can range in size from over a foot in diameter to less than .008 inch.

The woody transport roots increase regularly in diameter, and even display annual rings. It is this increase in size that swells the base of trees, raises the earth around them, and lifts sidewalks.

Roots can be damaged in a number of ways. Extremes of heat and cold, drying, and frost heaving in the upper layers of soil can kill many of the delicate, non-woody feeder roots. Foraging by nematodes and other soil creatures, as well as digging by humans, take their toll on roots. New roots form rapidly after injuries, but there is a limit to how much root mortality a tree can withstand. The severing of even a few major transport roots quickly reduces the total system.

Roots will also die when oxygen supplies are cut off by soil compaction, flooding, or construction of large, impervious pavement areas on the ground surface.




• A complex network of smaller non-woody **Feeder Roots** grow outward and upward from the framework roots. These smaller roots branch four or more times to form fans or mats of thousands of fine, short, non-woody roots. These slender roots, with their tiny root hairs, provide the major portion of the absorption surface of a tree's root system. They compete directly with the roots of grass and other groundcovers.

• The **Framework** of major roots usually lies less than eight to twelve inches below the surface and often grows outward to a diameter one to two times the height of the tree.

• The **Root Collar** is usually at or near the groundline and is identifiable as a marked swelling of the tree trunk.

• Because **Roots Need Oxygen** in order to grow, they don't normally grow in the compacted, oxygen-poor soils under paved streets.

Note: A few species have a **Taproot** that grows straight down three to seven feet or more until they encounter impenetrable soil or rock layers, or reach layers with insufficient supplies of oxygen.

• Between four and eleven **Major Woody Roots** originate from the root collar and grow horizontally through the soil. These major roots branch and taper over a distance of three to fifteen feet from the trunk to form an extensive framework of long, rope-like roots which are 1/4 to one inch in diameter. These are important structural roots, supporting the tree against wind, etc.