



# Community Trees

## Community Tree Steward Program

### Transplant Shock...Making the Case for Smaller Trees

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Large trees (3" to 4" caliper, for example) frequently experience a prolonged period of slow growth after being transplanted from nursery to the landscape. This adjustment period, characterized by small leaves and meager shoot growth, often lasts for several years. On the other hand, smaller trees (2" caliper for example) usually experience a shorter period of reduced vigor. In fact, a small tree may actually catch up to and eventually out-grow a larger tree. The explanation for slow growth rates after transplanting, especially with large trees, requires an understanding of the delicate balance between above- and below-ground portions of the tree.

Researchers have found when a tree is dug for transplanting, as much as 95 to 98 percent of its root system is lost and the capacity to absorb water from the soil is significantly reduced. Although this fact holds true for both large and small trees, a large tree loses a much greater percentage of its roots. Both large and small trees must restore the original balance between roots and above-ground portions of the tree before vigorous growth can resume.

According to Dr. Gary Watson, root physiologist at the Morton Arboretum, it can take as long as 7 weeks for new roots to be initiated from callus formed after a root is cut. It can be as long as 13 weeks before the regenerated roots absorb measurable amounts of water from soil outside the rootball, and at least 20 weeks until soil moisture is absorbed at similar rates from the rootball and backfill soil. Reduced uptake of soil moisture is a far greater problem for a large tree because of the relatively greater leaf surface area its root system must support. And, since roots of large and small trees grow at approximately the same rate (roughly 18 inches a year), it takes the large tree several years longer to reestablish the size of its original root system. Thus large trees often experience a long period of slow shoot growth, and in some cases, crown thinning after transplanting. Providing large trees with supplemental irrigation is extremely critical during the several year reestablishment period.

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The extended period of reduced vigor after transplanting, often called transplant shock, is understandable since the tree is supported by such a limited root system. Under Midwestern conditions, the period of reduced vigor will last approximately 1 year for each caliper inch. Until the natural root-shoot balance is restored, the tree will continue to experience some degree of transplant shock.

## Helping the Transplanted Tree

Some tree-care professionals recommend fertilization for recently transplanted trees to encourage shoot and root growth. But researchers have found increased crown development did not lead to better root development, and in fact, resulted in lower root/shoot ratios. The root/shoot ratio is the ratio of root weight to weight of the plant top or crown. For most trees under normal conditions, the root/shoot ratio is 1:5 to 1:6; the top is 5 to 6 times heavier than the roots. Increasing crown size through excessive fertilization also may put additional demands on a root system already too small to adequately support the tree. Preventing nutritional deficiencies through low to moderate fertilization will ultimately result in the best balance between roots and crown.

Roots will develop to their fullest extent when the root-zone environment is favorable. Loosening the soil to a depth of 6 to 12 inches with a rototiller or shovel in a large area surrounding the planting site is one way to create a sufficiently aerated root-zone environment conducive to vigorous root growth. Another effective way to improve the soil environment is through the use of organic mulch. Mulch applied over the root-zone is beneficial to newly transplanted trees because it eliminates turfgrass competition, helps retain soil moisture, moderates soil temperature fluctuations, and adds valuable organic matter to the soil.

To date, mechanical soil aeration has provided little benefit to trees after transplanting. Some researchers have found drilling aeration holes in the soil stimulated tree growth nearly as much as fertilization, while others report little improvement in soil aeration, bulk density, or root development.

Crown reduction has been a standard arboricultural practice used to compensate for root loss during transplanting. Until recently, a routine post-transplant practice was to remove 20 to 30 percent of a tree's branches in an effort to balance the crown with the remaining root system; thus reducing transpiration and water stress. But recent studies indicate this practice may be detrimental because it reduces the total leaf area and carbohydrate producing capacity of the leaf canopy. Other researchers have found pruning at transplanting had no effect (positive or negative) on leaf or root growth. Only broken, injured, weak, or interfering branches should be removed at transplanting time.

Proper watering is the most important post-transplant maintenance operation, but definite rules detailing frequency of application are impossible to give. Plants suffer as much from over-watering as from moisture deficiency. The soil moisture profile should be examined using a soil sampling tube if there is a question about the amount of soil moisture present.