

## How to Fertilize Shade Trees

*Nicholas Polanin, Somerset County Agricultural Agent; Martha Maletta, Hunterdon County Horticultural Consultant; and Winfred P. Cowgill, Hunterdon County Agricultural Agent*

### Introduction

Fertilization is just one of many cultural practices that can maintain or encourage plant development and vigor, improving resistance to certain insect or disease attacks, and increasing tolerance of environmental stress. Eighteen soil elements have been identified as essential for woody plant growth. The importance of a complete soil test prior to any fertilizer application cannot be overemphasized. Without the proper sampling and analysis completed prior to treatment, there would be no definitive decision-making process by which treatments would be deemed necessary. Nutrient management within IPM or Plant Health Care (PHC) management models takes into account current levels and plant growth demands, and must play a major role in fertilizer recommendations and subsequent applications. Nutrient deficiencies can usually be detected in off-color foliage, dieback, and other leaf or crown abnormalities, but without a complete soil analysis the fertilizer selected may not correctly address specific nutrient deficiencies or imbalances.

Shade trees planted in home landscapes and lining streets have been introduced into artificial and highly competitive environments. Rooting space is severely limited by the compacted and heavily engineered soils required for urban and suburban infrastructure. Grading and soil restructuring has removed vital nutrient reserves held in the humus or upper levels of the soil profile. Utility rights-of-way, line-of-sight, and



*Deprived of the benefits of a natural forested setting, trees in turf or parking lot conditions require supplemental nutrients to maintain their competitive edge.*

other factors hamper proper crown development. When grown under these stressful environmental conditions, shade trees can succumb to damage from opportunistic pests and diseases. Maintaining or increasing tree vigor through proper fertilization can play a vital role in the future success of our shade tree resource.

### Where to Fertilize

Research has shown that the majority of tree roots responsible for nutrient uptake and distribution are located within the top 18 inches of soil. Though these roots were previously thought to extend only to the drip line of the tree, they actually extend well beyond the edge of the canopy, depending on the tree species and grow-



ing conditions. This area should be the target area for fertilizer applications (see photo, page 2). One misperception is that providing regular applications of fertilizer to your lawn will also provide adequate nutrients to your trees. Turf growing directly under shade trees is a highly competitive groundcover, and the use of combined fertilizer/herbicide formulations available on the homeowner market can be damaging when applied directly under the tree's canopy. Except in the case of nitrogen, well-established turf and poor soil mobility will not allow potassium, phosphorus, and other nutrients broadcast at ground level to penetrate deep enough to benefit shade and landscape trees. Those trees suffering from nutrient imbalances or deficiencies will require direct soil applications for a successful fertilization treatment.



*Fertilizer treatment areas vary among species, growth characteristics, and size of tree. The white (middle) line in the picture above depicts the dripline or edge of the canopy, while the 2 yellow (inner and outer) lines depict the edge of the fertilizer applications areas under this flowering ash.*

## When to Fertilize

Early spring and late fall are considered the best times to apply fertilizer for shade trees. Most trees have their greatest need for nutrients in the spring, so an application after leaf fall will provide the best results during the following year. The health and vigor of shade trees can also be improved with spring fertilizer applications.

Avoid any applications that may stimulate growth too late in the growing season, as the tree will not harden off in time for the winter season. Deciduous trees can be fertilized once every year or two. Conifers may be fertilized in the early spring, the frequency of which dependent upon the vigor and desired growth.

## What to Use

Several fertilizer formulations are available in today's market. Selection of the best formulation should be directly related to the results of a soil test. Fifty percent (50%) organic fertilizer with a 3-2-1 ratio of nitrogen, phosphorus, and potassium (N-P-K) is commonly used where K and P are not severely deficient. Organic formulations, which need to be mineralized in the soil prior to uptake, can release larger amounts of nutrients when the temperature is high. New inorganic formulations, which are more readily available upon application and release nutrients more uniformly, can therefore be a superior application in certain instances.



## How Much Fertilizer

For the individual property owner, a correctly completed soil test will show the soil type, nutrient status and current pH and desirable pH ranges for the tree in question. Fertilization rates will be based on these results, which for most shade trees will range from 2 to 4 pounds of N per thousand square feet. Fertilizer recommendations are usually quoted in terms of actual N, P, or K. For example, a 10-6-4 fertilizer is 10% N, 6% P, and 4% K. To determine an amount of fertilizer needed,

divide the amount of actual nutrient needed, e.g. three pounds of N, by the decimal fraction of N in the fertilizer, i.e.  $3 / 0.1 = 30$  pounds. To calculate the square footage, measure the area under the tree canopy, making sure to include the area beyond the dripline (as discussed earlier). Do not measure up to the trunk flare of the tree, but stop several feet short (see photo, page 2).

## How to Apply Fertilizer

Steady supplies of balanced soil nutrients support healthier root structure and shoot development, consistent growth, and a higher tolerance of abnormal environmental conditions such as drought, disease infection, and pest infestations. There are several different methods available to apply fertilizer to shade trees. The method selected will depend on soil and growing conditions, time, fertilizer formulation, experience, and labor and equipment requirements.

**1. Surface Application:** Recommended amounts of fertilizer should be spread on the soil surface as throughout the treatment area (see photo, page 2). Water the area thoroughly after application to avoid injury to turf. Limiting the amount of nitrogen and utilizing several applications to provide the recommended nutrient levels will also lessen the chance of turf injury.

**2. Vertical Drilling or Mulching:** This is one of the best methods available to the homeowner. Drilling holes 2 inches in width at least 10 inches deep provides direct, deep fertilization to the tree's root system, fractures and aerates the soil profile, and permits quick, efficient, and even distribution of granular or liquid fertilizer under the tree's canopy. Placed 2 to 3 feet apart and evenly distributed throughout the treatment area, these holes should be made with a power soil auger, which is readily available through any rental supplier. The recommended amount of fertilizer should be apportioned equally among the holes. The holes can then be filled with peat moss or mulch. Simply using an iron punch bar to create the holes may suffice, but the bar will only reach a limited depth and may damage the soil structure surrounding the holes, negating

much of the benefit from aeration and soil fracturing. Drilling within the treatment area nearest the dripline should minimize any potential damage to the root system, drill bit, or operator. Also, be aware of any buried utility lines and sprinkler systems within the proposed treatment area, as severing these may have dire consequences.

**3. Fertilizer Spikes:** Fertilizer spikes can deliver nutrients directly into the root zone below the turf line, but with a very limited distribution. This method, though somewhat costly, also fractures and aerates the soil, providing additional oxygen for proper root development in compacted soils. Again, label directions must be followed for successful treatment.

**4. Foliar Application:** Extremely popular for the home gardener, foliar applications can deliver micronutrients such as iron directly to chlorotic (yellowing) leaves to correct localized nutrient imbalances. This method, however, has limited uses and provides no residual benefit to the plant's root system and soil nutrient levels. It is important to follow label directions to avoid fertilizer salt damage when using foliar applications.

**5. Professional Applications:** Trunk injections, implants, fertigation through irrigation systems, soil drenches, and pressurized soil injections are several methods utilized by today's arborist and landscape professional. They are specifically designed for use in certain restrictive environments. Soil injections have proven to be extremely beneficial, as they can deliver slow



release liquid fertilizer at 100 to 150 psi, while at the same time fracturing and aerating the soil at a depth of 12 to 18 inches. Consult with your local ISA Certified Arborist, New Jersey Certified Tree Expert, or tree maintenance professional to decide which application technique and formulation is best suited for your shade trees.



According to the recently released Tree Fertilization Standards, ANSI A300-Part 2, “The reason for fertilization is to supply nutrients determined to be deficient to achieve a clearly defined objective. That objective should be accomplished in a manner most beneficial to the plant.” Proper tree care, selection, and maintenance based on this and other modern guidelines in the field of arboriculture will ensure the health and longevity of shade trees throughout our communities.

### **Additional Resource Information:**

New Jersey Certified Tree Experts - NJ Department of Environmental Protection, Division of Parks and Forestry, Community Forestry Program, 501 East State Street, PO Box 404, Trenton, NJ 08625. For statewide or county listings, call 609-292-2532, or online at <http://www.nj.gov/dep/parksandforests/forest/community/cte.html>.

ISA Certified Arborists - The International Society of Arboriculture (ISA), PO Box 3129, Champaign, IL 61826-3129. For a listing of current ISA Certified Arborists, call 217-355-9411, or online at <http://www.isa-arbor.com>.

Professional Tree Maintenance, Safety and Training - Tree Care Industry Association (TCIA), 3 Perimeter Road - Unit 1, Manchester, NH 03103. Phone 1-800-733-2622 or online at <http://www.natlarb.com>.

National Standards for Tree Care Operations (Tree Pruning, Fertilization, Support Systems, and Lightning Protection) - Available online through the TCIA and ISA websites. Also available through the American National Standards Institute (ANSI), 11 West 42 Street, New York, NY 10036.

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