Fertilizer Guide

Part 3:

Trees Deserve At Least the Same Care as Turf

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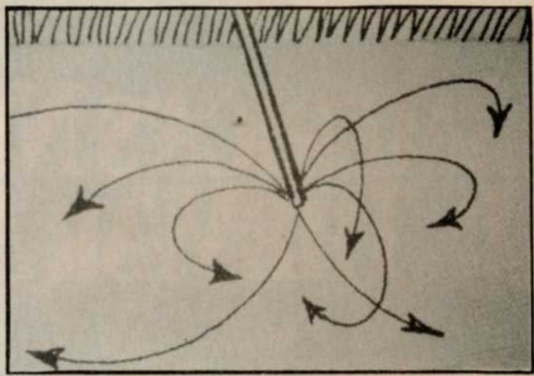


Liquid soil injection *provides good distribution of nutrients in the soil.*

Fertilization of landscape trees and shrubs is important because they are often grown out of their native habitat and are subject to adverse soil and environmental conditions.

Compacted soils, poor drainage, restricted root areas, highway salts, air pollutants and competition from turfgrass contribute to plant stress and increase the importance of regular fertilization to maintain healthy growth. Vigorous, well-maintained trees are more resistant to many insect and disease pests, are more attractive, and a greater asset to properties.

Trees absorb and utilize at least 13 elements from the soil. Of these, only nitrogen, phosphorus and potassium are normally considered when fertilizing. Supplemental nutrients, such as iron and manganese, may be necessary for certain species growing in alkaline soils.

Nitrogen is required in greater amounts than the other nutrient elements and is more often deficient in soils. Plants generally respond to applications of nitrogen, often with dramatic improvements in shoot growth and leaf color. Heavy applications of nitrogen alone may stimulate shoot growth more than root growth, disturbing the natural root-shoot ratio. Soil analysis for nitrogen is not particularly useful due to its transitory nature in soils and the large amount extracted by plants.

The need for supplemental phosphorus and potassium is difficult to determine since they normally do not produce a visible response except on young or newly transplanted trees and shrubs. Field study results have been inconsistent due to differences in soil, tree age and loca-

for trees

tion, and fertilization timing and methods.

Arborists fertilize trees and shrubs with a complete fertilizer where reliable soil tests are not available for phosphorus and potassium. The most practical approach is often to determine what elements are deficient in a market area and to base the fertilizer formulation on a market basis rather than case by case.

Plants in alkaline soils are more likely to need additional micronutrients.

Specific soil/plant deficiencies can be addressed, if necessary, on an individual basis. In most cases, a 3:1:1 or similar ratio is satisfactory for landscape plants. Additional potassium and micronutrients may be advisable in sandy soils.

Plants in alkaline soils, particularly ericaceous or "acid-loving" plants, may need additional micronutrients. Iron deficiency chlorosis is common on oak, rhododendron and pine grown in alkaline soils and has been reported on sweet gum, ginko and birch, as well as other woody ornamentals. Manganese deficiency chlorosis, common with maples, is also induced by alkaline soils.

Application rates

Most fertilizer recommendations are based on the number of square feet in the growing area for shrub beds or the branch spread of individual trees and shrubs. Fertilizer recommendations based on trunk diameter can result in overfertilization and damage to plants if the root system is restricted by paved areas, foundation walls, or other obstructions in the soil.

Three pounds of actual nitrogen per 1,000 square feet per year or six pounds every other year is satisfactory to maintain the health and vigor of deciduous trees and shrubs. If leaf color, annual growth, or general vigor is unacceptable, six pounds of nitrogen per 1,000 square feet may be applied annually.

Broadleaf evergreens, small shrubs, flowering trees and recently transplanted or declining trees are more sensitive to fertilizer salts and should receive only about one-half the recommended rate, particularly when quick-release fertilizers are applied. The risk of injury to sensitive plants may be reduced by splitting the recommended amounts into two or more applications.

The amount of fertilizer to be applied per 1,000 square feet of root area can be calculated by dividing the percent nitrogen on the fertilizer bag into the desired nitrogen per 1,000 square feet. For example, to determine the amount of 30-10-10 fertilizer required to apply six pounds of nitrogen per 1,000 square feet, divide 6 by .30 (30 percent). The result is 20 pounds per 1,000 square feet.

Application timing

Fertilization is most effective when supplemental nutrients are available during periods of optimum root growth. Although the roots of woody plants may elongate throughout the growing season, active root growth most often occurs in early spring and late fall when soil temperatures are relatively cool and there is little competition from leaves for water and nutrients.

Soluble nitrogen fertilizers, because of their short residual in soils, should be applied between October and December or between February and April. Controlled-release nitrogen ensures availability in the root zone for a relatively long period and application timing may not be a major concern.

Application techniques

Supplemental nutrients can be supplied to landscape plants through foliar sprays, trunk injections, or applications on or beneath the soil surface. Though each method has advantages in specific situations, woody plants are well-equipped to absorb nutrients through the root system and in most cases respond best to soil applications.

Surface applications

Nitrogen fertilizers can be applied to the soil surface since nitrates are highly mobile in soil solution and will move downward into the root zone. Surface applications for woody plants in sodded areas should not exceed one pound of soluble nitrogen per 1,000 square feet per application, or three pounds per 1,000 per application of controlled-release nitrogen.

Since turfgrasses within the application area may be injured or respond with undesirable succulent growth, trees and shrubs in quality lawns can be fertilized with subsurface applications, either placed in vertical holes or injected below the soil surface.

Fertilizer containing phosphorus should not be applied to the soil surface. Phosphorus is bound tightly to soil particles and does not move downward to the roots. Surface applications of phosphorus may also stimulate annual bluegrass in home lawns.

Fertilization is most effective when nutrients are available during optimum root growth, October to December and February to April.

Drill hole technique

Fertilizer can be placed in the root zone by drilling holes in the ground and dividing the recommended amount of fertilizer equally among the holes. For trees, the holes should be drilled 12 to 18 inches deep and 18 to 24 inches apart, beginning two to three feet from the trunk and extending two to three feet beyond the drip line of the tree or shrub.

To prevent turfgrass injury, the fertilizer level should be at least four inches below the soil surface. Calcined clay, Perlite, or other soil amendment can be used to fill the top of the hole. In quality lawns, a plug of grass can be removed before drilling and replaced after the fertilizer is added.

Soil injection

Liquid soil injection is an alternative to the drill hole technique. It provides more thorough nutrient distribution in the root zone and can be done in about one-fourth the time. But, you have to be careful since soluble fertilizers have relatively high burn potentials and may be rapidly leached from the root zone.

The injection equipment consists of a hydraulic sprayer operated at 150-200 psi and an injector probe that inserts about 12 inches into the soil. The injections are normally in a grid pattern about three feet apart in the same area as the drill hole technique.

Soluble nitrogen will stay in the soil for as little as six weeks.

The actual amount of soluble fertilizer applied is often less than one pound nitrogen per 1,000 square feet. The rate is moderate because of factors such as drought and decline which increase the sensitivity of plants to fertilizer salts. After application, soluble nitrogen may remain in the root zone for as little as six weeks, further reducing the amount of nitrogen available for absorption.

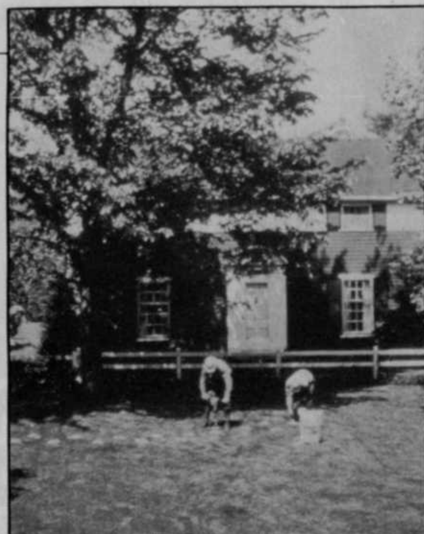
Suspension fertilizers are rapidly gaining acceptance for soil injection because of the limitations of soluble fertilizers.

Ureaformaldehyde is particularly effective as a controlled-release nitrogen source in spraying systems since the release rate is not greatly affected by particle size. Suspended in water, powdered UF can be injected into the soil and dispersed laterally by hydraulic pressure.

At least 60 percent of the total nitrogen in UF is water insoluble and becomes available over a one- to two-year period. UF has a significantly lower burn potential than soluble nitrogen sources.

The nitrogen salts are released gradually as the compounds degrade, safely supplying the recommended annual rate of three to six pounds of nitrogen per 1,000 square feet in a single application.

Soluble methylol and methylene ureas—reaction products of urea and formaldehyde—have recently been introduced in the lawn care industry. These compounds have a lower burn potential than urea or other soluble nitrogen sources but their release characteristics and usefulness in tree care have not yet been determined.



Drill hole technique *places the fertilizer under the soil surface avoiding lush growth of turf on the surface.*

Other methods

The aero-fertil technique injects dry fertilizer by blasts of air into holes which have been previously drilled in the soil. This method is similar to drill-hole application and provides additional aeration by fracturing heavy or compacted soils.

Fertilizer stakes or spikes are solid formulations of fertilizer driven into the ground at intervals beneath the drip line of trees and shrubs. Although they contain satisfactory fertilizer materials, one or two spikes per inch of trunk diameter provide only a small amount of fertilizer. Limited lateral distribution of the fertilizer within the root zone of most soils permits only a small amount of fertilizer to reach the root system.

Foliage sprays, trunk injections, and trunk implants supply a limited amount of nutrients to woody plants. They are recommended for micronutrients where availability is reduced by alkaline soil conditions. They are most effective when a single micronutrient is deficient.

Micronutrient deficiencies

Micronutrients are more likely to be chemically unavailable to roots than low in the amount present in the soil. Sandy soils are the exception to this.

Fertilizer

Soil applications to prevent or correct micronutrient deficiencies include nitrate or sulfate salts, chelates, and sulfur. Results have not always been satisfactory due, in part, to insufficient applications of the amending agent, severity of the deficiency, and soil problems such as excess alkalinity and poor drainage.

Foliar treatments, implants, and injections are discouraged for plants suffering from moisture stress.

Micronutrients in the form of nitrate and sulfate salts are often included in fertilizer formulations, but not in sufficient amounts to correct a deficiency. In addition, micronutrient salts may quickly become insoluble in alkaline soils and unavailable for absorption by plants.

Recommended rates for landscape plants vary depending upon the micronutrient source, the soil pH and texture, and whether or not the plants are growing in a lawn. Inorganic salts of micronutrients may injure turfgrasses at the rate recommended for woody plants and should be applied during the dormant period, preferably by subsurface application.

Chelates remain more soluble in alkaline soils than inorganic salts and can be applied to the soil surface or injected into the soil. Chelates also are less likely to cause injury to plants than inorganic salts and last longer in the soil. However, the cost of chelated micronutrients is considerably higher than for inorganic sources.

Chelates are marketed under various trade names with formulations for different conditions and purposes. Recommended rates usually vary from two pounds to six pounds per 1,000 square feet. Select the proper product for a particular situation and follow directions on the label.

Acidifying agents, such as sulfur and sulfuric acid, are normally injected into the soil or placed in vertical holes. Depending upon soil texture and pH, large amounts of sulfur may be required over a number of years to correct the pH of calcareous soils. To minimize the potential for injury to woody plants, 20 pounds per 1,000 square feet should be the maximum amount of sulfur applied at one time. Turfgrass injury has been reported at rates above five pounds per 1,000 square feet. Attempts to acidify large areas of soil with existing landscape plants have generally not been successful.

Foliar sprays are especially effective on ericaceous plants, such as rhododendrons, to correct iron deficiencies. Not all plant species, however, respond to foliar-applied micronutrients. Applications are recommended just prior to or during active shoot growth in the spring. Applications later in the season may also be effective.

Response to foliar treatments will vary depending upon the species, age and condition of the plant, time of year, micronutrient applied, and severity of the deficiency. For best results, the plant should not be suffering from moisture stress, the leaf surfaces should be thoroughly covered and the humidity should be high enough to allow the spray to remain on the leaf in soluble form long enough to be absorbed. Both chelated and inorganic micronutrients are recommended.

Trunk injections and implants are recommended to correct micronutrient deficiencies in trees over four inches in diameter which do not respond satisfactorily to soil treatments.

For trees which have begun to decline, the best results are usually obtained from trunk treatments in conjunction with soil applications of fertilizer. Once the deficiency has been corrected, attempts should be made to maintain adequate micronutrient levels in the soil to avoid repeated wounding of the trunk.

***Iron chlorosis** is evident on a maple.*

Injections or implants should be spaced four to five inches apart and as low as possible on the trunk. Since the outermost xylem (wood) rings are actively transporting water and dissolved minerals, capsules should be placed or injections made in this area. Capsules or materials which seal the injection hole should be inserted just below the bark tissue to facilitate proper wound closure. The best and most rapid callusing occur when treatments are made before growth starts in the spring.

In addition to commercially available injection and implant products, micronutrients can be injected with the same equipment recommended for Dutch Elm Disease, which is inexpensive and simple to use.

For iron-deficient pin oaks, dissolve 1.5 to 2 grams of ferric ammonium citrate in one to two cups of water for each injection.

Trees under moisture stress should not be treated with trunk injections or implants. **WTT**