Landscaping Committee
Doverbrook Association

Interim Report of the
Landscaping Committee to
The Board of Directors, Doverbrook Association
October 24, 2007

Background and Charter
The Landscaping Committee was formed by the Doverbrook Association Board of Trustees and they began to develop a committee. In January of 2007, the Board of Directors appointed Ken White as Chairman of the Landscaping Committee to review and make recommendations regarding the grounds at Doverbrook, and specifically regarding tree protection and replacement, turf and soil management, and recommended changes to accomplish its original intent for the Doverbrook Association.

Committee Members
The following Doverbrook residents serve on the Landscaping Committee:

Ken White, Chairman
Jessie Reid
Phil Ogiba
Paul Rodgers
Ron Picard
Douglas Lyman

Former members that have provided service to the Landscaping Committee:
Bob Benz
Mary Ann Benz
Lori Reynolds, Liaison

New members:
Robert Clary, Liaison

Summary of Activities:

See Minutes of Landscaping Committee

Plans

The Landscaping Master Plan

Doverbrook is extremely fortunate in having strong support for its activities in developing a plan for the Doverbrook community. Consequently, there has been substantial progress in developing planting standards and conducting a comprehensive inventory of the street tree population. The Landscaping Committee is now in a favorable position to properly manage its urban community. The Landscaping Master Plan is the guidance mechanism that will assist the Doverbrook Board of Directors in such an endeavor.

The Landscaping Master Plan consists of two documents: The Main Landscaping Master Plan, and a Street Tree Planting Plan

Purpose of the Landscaping Committee

The Landscaping Committee provides a comprehensive and multi-objective management plan for Doverbrook, consistent with various industry goals and standards. The Plan recommends methods to manage and care for urban trees and related vegetation on all land within the Doverbrook Association property limits. The Plan addresses what and how the goals can be achieved.

Goals of the Landscaping Committee

Develop an integrated, coordinated approach to the management of the Doverbrook Grounds, which has the support of all concerned Doverbrook Owners, Doverbrook Board of Directors Members, and the Management Staff, through enhanced communication and volunteerism.

Ensure the protection and management of the grounds and property at Doverbrook. The grounds are an essential part of the community’s infrastructure.

Secure stable funding and management resources to maintain and enhance the grounds.

Maximize and expand the urban tree canopy and produce multi-aged and diverse vegetation.

Assure that the Doverbrook landscaping is sustainable.

Carry out the plan using education as the primary means of implementation, incentives as the next, and regulations as the last resort.

Develop a plan that is socially equitable, providing benefits to all the residents of Doverbrook.

Develop a plan that is adaptable and responsive to change, providing benchmarks and schedules for implementation.

Provide various approaches to implementation, involving all aspects of the community in creative alliances and partnerships.

Growth Management.
While prospering and growing, we keep the sense of hometown, protect our natural resources and enhance our community appearance.

Most of the key benefits for the Doverbrook property are easily identifiable and are summarized below in general categories.

1. Aesthetics
2. Storm water Management & Detention and/ or Retention
3. Erosion Prevention and Control
4. Pollution Reduction/Air Quality
5. Pollution Reduction/Water Quality
6. Energy Conservation
7. Water Conservation
8. Noise Suppression
9. Microclimate Benefits and/or Mitigation of Urban Heat Sink
10. Psychological and Mental Health
11. Economic Benefits: Increased Property Values
12. Pedestrian Benefits/Shading of Sidewalks/Separation from Traffic/Traffic Calming
13. Habitat
14. Maintenance of Unique Local and Regional Character Defined by the Regional Landscape.

Tasks

As the working group begins work on the subsequent tasks, there should be general agreement on the major benefits of the Landscaping Plan that provide a general indication of what the plan should address.

This will provide context for work to be developed in the subsequent tasks and will help focus and direct the nature of the work being conducted. It is recognized that subsequent work in various Tasks may result in revisions, identification of other key benefits, or a determination that some of the benefits identified in the preliminary stage do not contribute as substantially as originally expected.

Task: Inventory of Existing Conditions.
In order to identify and define examples of healthy and unhealthy urban forest, it will be necessary to provide documentation of a variety of existing conditions. These examples will help identify strengths and deficiencies of the existing plans, regulations, programs, and/or enforcement. With the working group helping document existing conditions, staff will prepare a memo that compiles the documentation.

Task: Review of Existing Attitudes, Perceptions, and Concerns, Threats, Opportunities and Constraints.
This plan must address three major items: the technical aspect, the practical aspect, and the value-based aspect. It is intended to identify the range, strength and extent of different values in the community relating to the issues in the plan. This task will not involve a statistically-based survey specific to the plan, but will draw from other sources. Information contained in an annual community survey will provide some indication of issues that are directly or indirectly related to the issues in this plan. In addition, the participation of the members on the working group and people they are in contact with will provide a range of viewpoints.

The working group will also help identify potential threats or obstacles to maintaining or achieving a healthy urban forest, as well as key opportunities.

The review will include at least the following items, and other items identified by the group:

Values:
a. Community Survey Results
b. Stakeholder and Working Group feedback.

Concerns, Threats, Opportunities, Constraints:
a. Results of survey compared to urban community benefits
b. Supply/Demand issues, such as adequacy of local inventory and availability of stock required to meet size, number, and species requirements for new development
c. Adequate technical training for urban forestry health among those who grade and prepare sites, install, prune, and maintain trees, both for a living and do-it yourselfers
d. Educational efforts related to the benefits of urban forestry
e. Adequacy of existing regulations in relation to new development
f. Limitations on desired outcomes resulting from existing regulations
g. Potentially conflicting regulations for different purposes such as tree preservation.

Task: Develop Goals, Policies, and Objectives.
This task will identify goals for achieving a healthy urban forest and begin to identify the most effective ways to accomplish those goals, through a combination of implementation methods, including private sector, public sector, regulatory, voluntary, incentive-based, educational, and

other methods. To the extent possible, based on the previous tasks, this will identify measurable targets for putting these implementation methods and place and determining what they will need to accomplish.

Task: Develop Alternatives.
Once the goals, policies, and objectives are identified, the committee will identify a range of measures that can be undertaken to modify existing plans, policies, regulations, and programs; or establish new ones to accomplish the goals, policies, and objectives. The committee will identify advantages and disadvantages with various approaches.

At this stage, Staff will schedule and conduct Public Open House #1 to present the alternatives to the public. There will be an opportunity for the public to comment on the alternatives and make recommendations regarding other alternatives.

Task: Evaluate Alternatives and Select Preferred Alternatives.
Based on the range of alternatives developed in the previous task and the community feedback from the Open House, the group will discuss the most effective alternatives, and narrow them down to the most effective ways to accomplish the goals.

At this stage, staff will schedule and conduct Public Open House #2 to present the preferred alternatives to the public. There will be an opportunity for the public to comment on the preferred alternatives.

Task: Refine Preferred Alternatives.
It is expected the selection of preferred alternatives will still be at a more general level that will need refinement. Based on the previous work and feedback from Open House #2, this task will refine the alternatives to adoptable products. It is expected that 2-3 meetings with review/comment opportunities will be needed to arrive at final alternatives. The final alternatives may include items that can be implemented immediately, items that will require budgeting or action over an extended period of time, and potentially recommendations on additional work and "next steps" needed for work that was determined to be beyond the scope of this plan.
When the group determines the documents have been refined and are ready for adoption, they will provide a letter endorsing the work.

Task: Plan Adoption and Amendments to Plans, Ordinances, and Programs.
Staff will submit the plan for adoption.

Task: Documentation, Ongoing Review and Monitoring.
It may be desirable to document conditions over time so future groups can review the effects over time. Since the Landscaping Committee is a standing committee, it is desirable to have that group responsible for initial documentation, and subsequent review and monitoring.

Task: 1-Year Review.
After 1 year, the adopted elements will be reviewed to determine what is and isn't working well and may need to be adjusted to be more effective.

Preliminary Identification of Issues
Inventory of Existing Conditions
Review of Existing Plans, Policies, Regulations, and Programs
Review of Existing Attitudes and Perceptions & Concerns, Threats, Opportunities and constraints
Review of Plans from Other Communities, Best Practices, and
Available Statistical Information
Refinement of Issues
Goals, Policies, and Objectives
Alternatives
Evaluation of Alternatives and Selection of Preferred Alternatives
Refinement of Preferred Alternatives
Final Plan and Amendments to Plans, Ordinances, and Programs

The Audience

The Landscaping Master Plan is designed for the following audiences:

Doverbrook Residents
The plan contains information available to Doverbrook residents about the Landscaping Master Plan: what it is, where it is and the benefits that it provides.

The plan provides general information about trees and related vegetation as well as specific information on street tree planting and landscaping requirements, and activities in sensitive use and natural areas. The plan also includes an Owner's Manual to assist in tree care.

Developers
The plan addresses requirements for tree preservation and landscaping, and provides information about the advantages of preplanning to all developers.

Key Recommendations

The Landscaping Committee makes the following general recommendations:

Inventory and assess the health and condition of the Doverbrook grounds.

Continue to identify planting opportunities and needs; promote and coordinate planting among private property owners.

Implement planting and design standards for all areas of the Doverbrook Grounds.

Promote maintenance practices that foster the health and safety of the Doverbrook Grounds. Implement a public education program to promote the care, preservation and enhancement of the grounds at Doverbrook.

Promote incentive programs to encourage compliance with recommendations that improve the Doverbrook Grounds.

Seek adequate funding to effectively manage the Doverbrook grounds and enforce regulations. This plan also proposes alternate funding possibilities as well as consolidation and improvement of existing services and resources.

One element that is common to all of the above recommendations is the need to coordinate the many activities among the various groups that affect the Doverbrook Grounds. It will take great commitment and cooperation among all of Doverbrook citizens to make today's vision of the Doverbrook grounds into tomorrow's reality. To this end, methods to recruit, train and utilize volunteers are described in the plan.

The result of the Landscaping Committee’s actions, or of its inactions, will be measured in the years to come. One the Landscaping Committee’s goal is to have a healthy and sustainable ecosystem on our property at Doverbrook that contributes to the economic and environmental vitality of Doverbrook.

Doverbrook grounds, a mosaic of planted landscapes and what remains of the native forest, is a reflection of Doverbrook’s health, well being, and livability. It is an important part of Doverbrook’s character, giving Doverbrook a special sense of place.

Open spaces and urban stream corridors define a sense of space in our community while providing a quiet respite from hectic urban life. Neighborhoods with tree-lined streets offer shade and protect us from inclement weather. Shaded areas help save energy, reduce noise, and soften the hard edges of structures and paved areas.

Master Plan: Basic Needs

Basic Needs
Plant growth is a very complicated process, but it is not necessary to understand all the intricate details in order to successfully manage the Doverbrook Grounds. However, understanding the basic requirements of tree growth will help.

The primary environmental factors are:

Soil is a reservoir for nutrients and moisture, and provides mechanical support.
Relationship of Air and Water in the Soil
Air supplies carbon dioxide and oxygen.

Plants obtain these basic needs from a complex, but finely balanced biological system. Cultivation often disturbs the natural balance. Any factor in the plant's environment that becomes less than optimum will limit its growth. Naturally, quantity is important, but quality also affects the vigor of trees. Air pollution, construction activity, and soil compaction place stresses on trees.

Healthy trees can better with stand these stresses year after year. This section describes principles of tree growth and their relationship with the environment. Knowing these basics will help the people responsible for tree management make wise decisions.

Priorities

1. **The Maple Decline**
2. **The Crabapple Blight**
3. **Turf management**
4. **Tree replacement**

Maple Decline:

Introduction

Maple decline affects primarily Sugar maple, Norway and Red Maple in the Northeast. The problem is not a new one. Maple decline is not a disease specifically, and is not contagious.

It is instead a general term used to refer to the collection of problems found on maple which result in a decline in tree vigor. Many of these problems are not specific to maple trees, and suggestions for prevention or care would be the same for other, similarly affected shade trees.

In forests, maples usually begin decline after several successive years of defoliation by insects. Affected trees not only lose their first set of leaves to these insects, but will often use up valuable food reserves to produce a second set. During and after "re-foliation", chemical changes occur in the tree that increase its susceptibility to secondary pathogens. Root Rot, Branch Canker, and Twig Blight are three fungi that frequently attack and may kill trees weakened by defoliation and re-foliation.

In urban sites principal stress factors in maple decline include drought, de-icing salts and/or road and sidewalk construction. These stresses also facilitate invasion by secondary organisms including root rots, decays and twig blights which greatly reduce chances of recovery from original stress. No matter which of the three environments maple decline occurs in, the sequence of events is similar. Healthy trees are stressed repeatedly, the stresses alter the tree's internal chemistry to allow repeated attack by secondary organisms, and the trees ultimately die.

Symptoms

1. Reduced twig growth. Yearly twig growth varies considerably between trees and even within the canopies of individual trees.

2. Reduced foliage growth. Keep in mind the normal, healthy appearance of the particular maple species' foliage. Foliage that is sparse, light green and/or scorched signals that the tree may be declining.

3. Early fall coloration. Maples normally begin showing fall color after the first frost or in mid-to-late September. When fall color develops earlier than normal, in late July or early August, the maple is suffering from decline.

4. Dead branches in upper canopy. Small dead branches seen in tree tops in late spring or early summer are indicative of decline. Over time, larger, more visible branches and limbs will dieback. The more numerous the dead twigs or branches are, the more severe the decline condition.

5. Poor root condition. If roots can be examined, look for reduced occurrence of small feeder rootlets; dead, brittle roots; and decaying buttress roots.

Control Strategies

Treatment for declining urban maples includes watering, fertilizing, pruning dead branches, and reducing salt-laden spring water runoff over the roots. Thoroughly water trees every week or two during extended dry weather. Trees should be watered with a slow stream from a hose. Move the hose periodically to soak the entire soil area under the tree's branches to a depth of six or more inches.

Fertilize trees: with a complete fertilizer in the spring and/or late fall. The general recommendation is 2 to 4 lbs fertilizer per inch of tree diameter (0.35 to 0.7 kg per cm of tree diameter at 1.5 m above ground). Broadcast the fertilizer over the surface of the ground. Some risk of burn on nearby turf may occur at the higher rates. Prune dead branches as well to possibly stimulate renewed, vigorous shoot growth.

Pruning: is best done in the early spring, prior to bud break, to promote healing of the pruning cuts. Road salt impact can be reduced by placing a barrier (curb, burm, ditch, etc.) which will catch and/or divert the spring runoff water which often contains copious amounts of salt. If soil and foliar analyses have been run and high sodium or chloride concentrations were found, then leaching the soil with fresh water or applying gypsum to improve the soil structure or texture may be useful.

Planting: By the time symptoms are noticed, the tree may be beyond being restored to its original splendor. However, at this time another tree may be planted which will eventually replace the declining maple. In this way the newly planted tree will have a few years to grow prior to the removal of the declining maple. Plant young maple trees away from roads to avoid de-icing salt problems.

The success of treatment to declining maples depends primarily on early detection of maple decline, the health of the tree prior to treatment, and/or its ability to respond to treatment. Positive diagnosis will often depend on "on the spot" examination or the amount of information obtainable from the person submitting a sample. However, the prescribed treatments of fertilizing, watering and pruning will not damage healthy trees.

Fertilizing Trees and Shrubs

Trees and shrubs growing in their natural habitats rarely display symptoms of nutrient deficiency. This is due not only to the natural recycling of nutrients that occurs in nature, but also to the fact that plants in the wild will grow only where they are best adapted or have a competitive advantage.

Nursery, street tree, and landscape plantings are, for the most part, an artificial habitat. Soils may be vastly different from those of the native habitat of a given plant, and nutrient recycling systems may be altered or diminished as a result of planting schemes (planting in turf areas) or maintenance practices (collection of fallen leaves). For these reasons, periodic applications of fertilizer to the soil beneath ornamental trees and shrubs are sometimes needed to replenish essential mineral elements and to promote healthy growth.

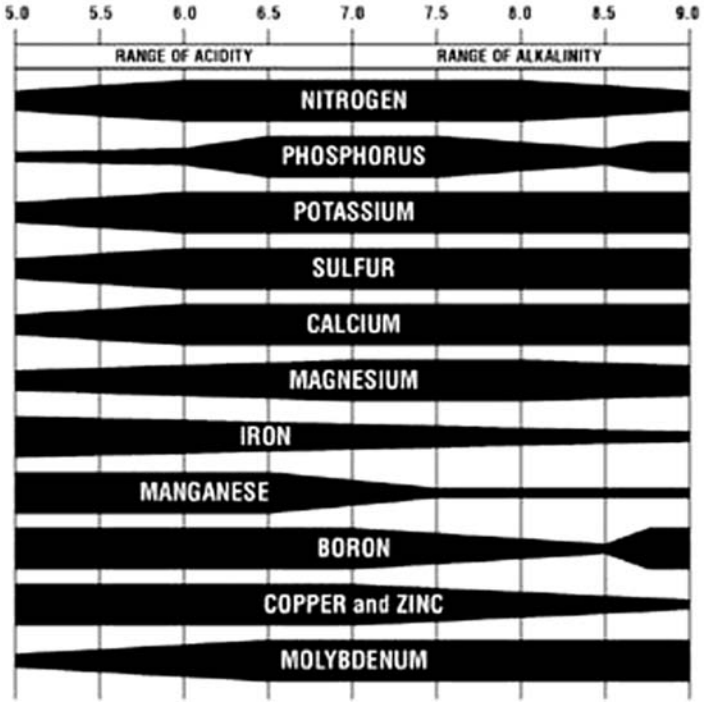
In landscapes and field nurseries, it is important to select species that are best suited to the site. A program of cultural practices that sustains or replenishes soil organic matter and nutrients should also be established. These practices might include incorporating compost into soils at the preplant stage, applying organic mulches, and cover cropping. Proper maintenance of soil fertility and attention to plant nutritional requirements is at the heart of an effective Plant Health Care program.

Soil pH

A fertility program for woody plants begins with obtaining an analysis of soil pH or level of acidity. Soil pH is measured on a scale of 0 to 14. Soils with a pH below 7 are acidic while those above 7 are alkaline.

Adjusting pH levels is important not only because specific plants grow best within a certain range of pH, but also soil pH affects the availability of both major and minor nutrient elements. Furthermore, soil pH influences the level of microbial activity in soils.

Microbes involved in mineralization of organic matter are most active between a pH of 6 and 7. At extremes in pH, many nutrients occur in forms unavailable for uptake by plant roots. Figure 1 shows the relationship between pH and availability of elements essential to plant growth.



Analysis of soil pH levels should be routinely made prior to any planting in nursery soils or at landscape sites. Typically limestone is required to adjust pH upward while sulfur is used to lower pH.

It is best if these materials are incorporated into soils prior to planting, since surface applications are slow to affect pH levels. Most liming and sulfur recommendations are based on the assumption that the material is worked in to depths of 8 inches. Deeper incorporation of either limestone or sulfur will require adjustments in rates to accommodate larger volumes of soil.

What to use?
Basic plant nutrition involves the uptake of sixteen mineral elements essential to plant growth. In addition to carbon, hydrogen and oxygen, which are obtained from air and water, the elements nitrogen (N), phosphorus (P) and potassium (K) are required in greatest abundance.

Research in woody plant nutrition has shown however that nitrogen is the element that yields the greatest growth response in trees and shrubs. For this reason, high nitrogen fertilizers with N-P-K ratios of 4-1-1, 3-1-1 or 3-1-2 are generally recommended for feeding established woody plants. These include fertilizers with analyses such as 8-2-2, 15-5-5, 24-8-16 and similar formulations. The analysis refers to % nitrogen, % phosphorus (as P2O5) and % potassium (as K2O) in the fertilizer.

Phosphorus, potassium and essential elements other than nitrogen are slow to be depleted from soils. Provided these nutrients are at recommended levels, a fertilizer program for established woody plants can consist of applications of nitrogen sources alone. Under normal conditions, complete fertilizers as mentioned above may be used every 4 or 5 years to ensure a supply of the other essential nutrients.

Application of slow-release forms of nitrogen provide the most efficient use of this nutrient because root growth and nutrient absorption can occur anytime soil temperatures are above 40°F.

On fertilizer labels, slow-release nitrogen is represented as Water Insoluble Nitrogen or WIN. Isobutylidene diurea (IBDU), ureaformaldehyde, sulfur-coated fertilizers (e.g. Sulfur Coated Urea) and resin-coated fertilizer are commonly used sources of slow-release nitrogen or WIN.

Fertilizer Math: Calculating the amount of a given fertilizer formulation to apply per 1000 sq. ft. is based on both the results of a soil test and the % nitrogen in the bag. Use the following method:

number of pounds of nitrogen needed x 100%

% of nitrogen in the bag
= pounds of fertilizer to apply per 1000 square feet

Example: Assume the fertilizer to be used is a 30-10-10 formulation with 30% nitrogen.

3 pounds of nitrogen needed x 100%

30% nitrogen in the bag
= pounds of fertilizer to apply per 1000 square feet.

300

30
= 10 pounds of 30-10-10 per 1000 square feet.

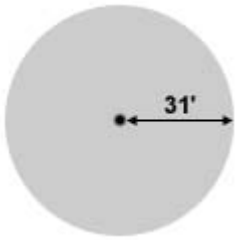
Area Method: In the past, determination of the correct amount of fertilizer to apply was based on the DBH (Diameter at Breast Height) of the tree or on the root area measured in square feet. Today, only the square foot method is recommended, since this reduces the risk of over-fertilization. When calculating the area of a tree or shrub bed, only measure the area where fertilizer can actually be applied. Do not include areas such as the driveway or sidewalk.

A. Area of a square or rectangle: To measure the root area of a tree or shrub growing in a confined area that is a square or rectangle, measure the length and width of the area to be fertilized and multiply the two to get the area in square feet.

Example: length x width = square feet
60 ft. x 50 ft. = 3,000 square feet

B. Area of a circle: To measure the area of root coverage for a tree or shrub in a non-confined site, calculate the area of a circle. Measure the radius in feet from the trunk out to the drip line, or beyond for larger specimens.

Example:



πr2 = square feet of a circle

3.14 x (31 x 31) = 3017 square feet

Nitrogen in slow-release form may also be obtained from natural organic fertilizers.

Because of a lack of industry standards for the definition of "organic" and "natural" a great deal of variability exists among these products in terms of their composition and analysis. For those adhering strictly to "organic" methods, the label of a given product should be examined for organic certification either by the state agriculture department or organizations such as NOFA (National Organic Farmers Association). The term "natural" is used here to indicate fertilizers that are not synthesized but are derived from naturally occurring materials.

Before applying natural fertilizers, the user must be aware of the nutrient analysis, i.e. the amount (by percent) of N, P and K, and the rate of release of the nutrients. Often mineral elements in natural materials, whether organic or inorganic, are released very slowly. This can benefit plants if nutrient release is steady and continuous over a long period of time. However, these materials may be of little immediate value in correcting nutrient deficiencies. Generally, slow-release

materials must be applied in large amounts so that a balance exists between the rate of release and the amount of nutrients available at a given time for absorption by plant roots. Unfortunately, objective information on rates of release of mineral elements from natural materials is often lacking, in part because rate of release is a function of highly variable environmental factors.

Fertilizer labels do contain information on how fast the nitrogen will be released. The WIN (Water Insoluble Nitrogen) number will list the percent of nitrogen that is insoluble or slow-release. The WIN number is compared to the percent of total nitrogen in the fertilizer. As an example, a fertilizer with a total of 30% nitrogen and a WIN percent of 15 (50% of the total nitrogen) would be considered slow-release. That is, when the WIN is equal to or more than 50% of the total nitrogen, the nitrogen is considered to be slow-release. If WIN is less than 50% of total nitrogen, the nitrogen is considered to be fast-release. A true organic fertilizer would be almost 100% slow-release.

Compost, well-rotted manures and sewage sludge may be used to fertilize woody plants, although their nutrient composition is quite variable. Those forms of compost, manure, or sludge that are sold commercially as fertilizers will have nutrient analyses listed on the product package. When buying bulk quantities of compost materials, always request a nutrient analysis of the product. These materials can supply some nutrients and contribute significant amounts of organic matter to improve soil structure and fertility and should be a part of a soil and fertility management program. Compost guidelines for the Northeast suggest applying finished compost at a rate of no more than 4 cubic yards per 1000 square feet (3/4 inch thick layer of compost).

Rates of application

Preplant application
Preplant incorporation of phosphorous and potassium into soils should be based on soil test results. It is advisable to incorporate these nutrients so that they will be in the root zone when woody ornamentals are planted. This is especially important for those mineral elements that are not very mobile in soils. Phosphorus, for example, moves very slowly, as little as one inch per year from the site of application. Superphosphate (0-20-0), triple superphosphate (0-40-0), ammonium, and potassium phosphates are commonly used forms of phosphorus fertilizer. Rock phosphate is a natural source of phosphorus, but rates of application should be adjusted to accommodate the very slow rate of release of the nutrient. Particular attention must be paid to phosphorus levels in soils planted to needled evergreens since their growth response to nitrogen is greatest when phosphorus levels are high.

Preplant incorporation of potassium can provide sufficient reserves to support plant growth for five years in soils that are high in organic matter or clay content. When dissolved in soil water, potassium is a positively charged chemical (cation) and binds to particles of clay and organic matter. With high levels of clay and organic matter, potassium can be added in a single application. More frequent applications of this nutrient are necessary in sandy soils because they have less ability to bind potassium. Common fertilizer forms of potassium include potassium chloride (muriate of potash), potassium sulfate, potassium nitrate, and natural materials such as kelp meal, greensand and alfalfa meal.

Rates of application of phosphorus, potassium, and nutrients other than nitrogen should always be based upon soil test results. Any nitrogen applied as a preplant nutrient should be in a slow-release form or natural organic form.

Postplant application
Rates of fertilizer application are typically based upon the amount of nitrogen in the fertilizer since nitrogen is the mineral element most responsible for vegetative growth. For annual maintenance, it is recommended that a tree receive 1 to 3 pounds of actual N per 1000 sq. ft. of surface area (see Fertilizer Math). The actual amount of a fertilizer to apply for maintenance of woody plants may be determined by the area method (see Area Method).

Reduce the amount of fertilizer applied at any one time to trees on shallow, sandy, or poor sites, so as not to burn the plant's roots. Using fertilizers with slow-release forms of nitrogen will also

help reduce the possibilities of root injury in such situations. Rates of nitrogen application should be adjusted on sites where there is a high potential for ground water contamination from nitrate leaching. On such sites, nitrogen application rates of 1 lb N/1000 sq. ft. or less would be advisable. Several applications at these reduced rates may be made during the growing season if needed for improving plant health. Again, use of slow-release forms of nitrogen can reduce the potential for leaching.

Rates of nitrogen application should also be adjusted according to levels of soil organic matter. Applying high rates of nitrogen to soils low in organic matter will accelerate depletion of the organic matter and in the long run reduce the fertility and structural integrity of the soil. Analysis of organic matter levels may be requested when submitting soil samples for testing. Soil organic matter levels of 4% or greater are desirable. In coastal areas where organic matter content of sandy soils is often in the range of 1-2%, use fertilizers with at least 50% of the nitrogen in water-insoluble (WIN) or slow-release form. In general, at a pH between 6 and 7, it can be assumed that 1/4-1/2 pound of nitrogen per 1000 square feet is being made available per year for each one percent of organic matter in the soil. Therefore, a soil with 4% organic matter can contribute from 1-2 pounds of nitrogen per 1000 square feet per year. That is typically enough nitrogen to support healthy growth of woody plants.

Methods of application
There are several methods of applying fertilizers to trees and shrubs. The method selected depends upon soil characteristics, site factors, cost, and type of nutrients to be applied.

Liquid soil injection: This is the method most often used by professional arborists because it is quick, easy, and also leads to rapid uptake of nutrients. It utilizes high pressure injection of liquid fertilizer into the soil. Injection points should be 2-3 feet apart depending upon pressure and about 8-12 inches deep. Slow-release forms of liquid injection fertilizers are also available.

Drill hole: This technique requires drilling holes into the soil and distributing granular fertilizer evenly among the holes. Holes are drilled to depths of 8-12 inches and are spaced 2-3 feet apart in concentric circles around the tree, beginning at a point about 1/3 the distance from the trunk to the drip line and extending 1-3 feet beyond the drip line. While rarely used today on a commercial scale, this method is effective in opening heavy compacted soils, allowing fertilizer, water and air to reach the root zone. The holes may be left open or filled with compost, peat or other organic material. The drill hole method should be used where high fertilizer rates or fertilizers with a high salt index create a potential for injury to fine turf.

Surface application: Granular forms of fertilizer may be spread by hand or mechanical spreader over the surface of soil around trees and shrubs. This method is quick, easy and inexpensive, and recent studies have shown this method to be as effective in supplying nutrients to plant roots as other techniques. It is particularly appropriate for applying fertilizers to mulched areas and shrub borders. A tree growing in a lawn area will utilize nutrients from surface applications of fertilizer made to the lawn and may not need additional fertilizer.

Fertilizer spikes/stakes: With this method, solid rods of a pre-measured amount of fertilizer are placed in holes in the soil around woody plants. Wide spacing of holes and slow lateral distribution of nutrients limit the effectiveness of this technique. It is not recommended.

Foliar fertilization: This technique entails spraying liquid fertilizers onto the foliage of plants. It is used primarily as a "quick fix" for minor nutrient element deficiencies. Foliar feeding is not effective in supplying essential nutrients in quantities necessary for satisfactory growth. The most effective time to spray foliage with micronutrient solutions is just before or during the growth period.

Tree trunk injections: Injections of nutrients directly into a tree is used almost exclusively to correct minor element deficiencies, e.g. iron, manganese and zinc. This technique may also be used in urban settings where root or surface applications of fertilizers are not practical.

Frequency of application
Frequency of application depends on the general vigor and growth of the plant, with the exception of newly planted trees and shrubs. Woody plants growing in rich soils with continual replenishment of nutrients from decomposition of organic matter may not need regular fertilizing. However, plants that are in a nursery production cycle, as well as landscape plants that show either abnormal leaf size or color, little or no annual growth, or significant amounts of dead wood within the plant, should be fertilized annually.

Time of application
Fertilizers are best applied in late August through September. Root absorption of nutrients is very efficient in late summer and remains so until soil temperatures approach freezing. Nitrogen that is absorbed in fall will be stored and converted to forms used to support the spring flush of growth. The next best time to fertilize woody plants is early spring prior to initiation of new growth.

Street Tree Standards

Street Trees

Landscaping is a significant factor in maintaining the livability and economic viability of our community. Trees provide shade and shelter, help conserve energy, moderate local climate in developed areas, assist in preventing erosion of soils, and eliminate pollutants from the air.

Street Trees

Street trees should be located outside of street right-of-way except in cases where there is a designated planting strip in the right-of-way.

Small or narrow stature trees (under 25 feet, less than 16 feet wide) may be spaced at any interval 20 feet apart or greater.

Medium sized trees (25 to 40 feet tall, 16 to 35 feet wide) may be spaced at any interval 30 feet apart or greater.

Large trees (over 40 feet, more than 35 feet wide) may be spaced at any interval 40 feet or greater.

Trees should not be planted closer than 25 feet from the curb line of intersections of streets or alleys, nor closer than 5 feet from private driveways (measured at the back edge of the sidewalk), fire hydrants, or utility poles.

Street trees should not be planted closer than 20 feet to light poles.

Trees should not be planted closer than 2-1/2 feet from the face of the curb except at intersections where it shall be 5 feet from the curb, in a curb return area.

Trees should not be planted where there are overhead power lines. Tree species should be chosen that will not interfere with those lines.

Trees should all not be planted within 2 feet of any permanent hard surface paving or walkway. Space between the tree and such hard surface may be covered by nonpermanent hard surfaces such as grates, bricks on sand, paver blocks, cobblestones, etc. This means that sidewalk cuts in concrete for tree planting should be at least 4 X 4 feet to help allow for air and water into the root area.
Trees, as they grow, should all be pruned to provide at least 8 feet of clearance above sidewalks and 12 feet above street roadway surfaces.

Approved Street Trees

The following tree species are recommended for use as street trees:

Small Trees
Small or narrow stature trees (under 25 feet, less than 20 feet wide) may be spread at any interval 20 feet apart or greater. Sidewalk cuts to be a minimum of 4 x 4.

Acer Ginnala Flame - Flame maple
Cornus Florida - Flowering Dogwood
Pyrus Calleryana - Aristocrat - Aristocrat Pear
Pyrus calleryana - Glens Form - chanticleer flowering pear
Prunus Sargentii "columnaris" - sargent columnar cherry
Cercis Canadensis - Eastern Redbud

Medium Trees

Medium size tree (25-40 feet tall, 16-35 feet wide) may be spread at any interval 30 feet apart or greater. Sidewalk cuts to be a minimum of 5 x 5.

Acer platanoides "crimson king" - crimson king maple
Prunus serrulata "kwanzan" - kwanzan cherry
Cercis canadensis - eastern redbud
Acer Rubrum “October Glory” - October Glory maple
Pyrus calleryana "redspire" - Redspire pear
Nyssa Sylvatica - Black Tupelo
Prunus subhirtella "autumnalis Rosea" - autumn flowering cherry

Large Trees
Large trees (over 40 feet, more than 35 feet wide) may be spaced at any interval 40 feet or greater. Sidewalk cuts minimum 6 x 6.

Acer Rubrum “Armstrong” - Armstrong Maple
Acer Rubrum “Franksred” - Red Sunset Maple
Fraxinus Oxycarpa “Raywood” - Raywood Ash
Tilia cordata “Greenspire” - Greenspire Linden
Acer Saccharum “Green Mountain” - Sugar Maple
Fraxinus Americana “Junginger” - Autumn Purple Ash
Quercus palustris - pin oak
Liriodendron tulipifera - tulip tree
Fraxinus Pennsylvanica “Marshall” - Marshall Ash

Trees to be planted Under Power Lines
Small Trees - small or narrow trees (under 25 feet, less than 20 feet wide) may be spread at any interval 20 feet apart or greater. Sidewalk cuts to be a minimum 4 x 4.

Cercis Canadensis - Eastern Redbud
Acer Ginnala - Flame Maple
Cornus Kousa - Kousa Dogwood
Prunus Cerasifera “Thundercloud” - Thundercloud Plum

Prohibited Street Trees:
The following tree species are prohibited from use as street trees as their roots cause injury to sewers, pavements, and sidewalks:

Salix spp - willows
Populus spp - cottonwoods/poplars

Street Trees Not Recommended:
The following tree species are not recommended for use as street trees, for the reasons listed after each species. These trees may be planted if the problems are satisfactorily met and accepted by the owner, and so noted on the site plan. Some are desirable trees in the right situation.

Acer macrophyllum - big leaf maple; roots cause injury to sewers and pavement.
Acer Negundo - box elder; subject to wind damage.
Ailanthus - tree-of-haven; short lived, invasive roots.
Albizzia julibrissi - silk tree; litter, aggressive roots.
Alnus rubra -red alder; short lived, brittle, favorite of tent caterpillars.
Betula spp - birches; aphids, low branching, invasive roots, injury to sewers, pavements.
Catalpa - invasive roots, short lived, messy sidewalk problems.
Crataegus spp - hawthorns; insects and disease prone, aphids.
Platanus spp - sycamore, london plane; vigorous roots, damage to sidewalks, sewers, serious anthracnose disease.
Robinia pseudoalacia - a black locust; brittle, hazard, agressive roots, thorny.
Sorbus ausuparia - mountain ash; large crop messy fruits may be sidewalk hazard.
Nut trees - litter

Maintenance

Technical Guide to Urban and Community Forestry, Maintenance of Established Trees

Maintenance of established trees differs significantly from that of newly planted trees. if a young tree fails, the tree itself is lost. But, improper maintenance or neglect of an established tree may result in damage to property or people. In addition to losing the benefits of a well established tree, proper maintenance directly affects the safety, health, and welfare of urban inhabitants. Maintenance involves several categories of activities, including: scheduling, pruning, controlling insects and disease, fertilizing and aerating, as well as removing trees and stumps.

Tree Hazard Inspections

Most tree hazards can be prevented by regular checkups and proper treatments. To determine the scope of work, a field survey should answer thirteen questions.

1. **Target:** If the tree falls will it hit cars, houses, power lines or people? If so, the need for immediate action becomes much greater.
2. **Architecture:** Has the tree grown beyond its normal form into a dangerous form?
3. **History:** Has the tree lost large branches recently?
4. **Edge Tree:** Were neighboring trees cut away recently leaving tall trees at the edge?
5. **Dead Branches:** Are there dead tops or branches? Is the tree dead?
6. **Cracks:** Are there deep, open cracks in the trunk and branches? Cracks are major starting points for trunk and branch failures. Crack drying is just as important a factor leading to failures as over loading and decaying wood.
7. **Crotch Cracks:** Are there deep, open cracks below joining stems?
8. **Living Branches:** Do living branches bend abruptly upward or downward where tips of large branches were cut off? Living branches may pull out of trunks that are weakened by rot or cracks. Long periods of hot, dry weather may dry out the rot or cracks and weaken the union of the branch on the trunk. Beware of large branches on rotten or cracked trunks.
9. **Topping:** Are large branches growing rapidly from topping cuts on big trees? Sprouts that lean away from topping cuts have weak attachments. Sprouts near the edge of a cut may roll inward as it grows and further weaken the attachment.
10. **Storm Injury:** Are there broken branches, split trunks, or injured roots? Are branches close to power lines?
11 . **Root Rot:** Are there fungus fruit bodies (mushrooms) on roots? Were roots injured by construction?
12. **Rots and Cankers:** Are there hollows or cankers (dead spots), some with fungus fruit bodies? Is the tree leaning?
13. **Construction Injury:** Have roots, trunk, or branches been injured? Is there a new lawn or garden over injured roots? Water and fertilizer applied to new lawns over injured roots are absorbed by the tree's smaller, non-woody roots. The water and fertilizer stimulate the growth of the fungi that are rotting the injured woody roots. While the woody support roots grow weaker, the tree top gets larger and heavier. Once the root structure is sufficiently weakened, a moderate storm could cause the tree to fall.

Scheduling

Most public agencies use two approaches for deciding when to do tree maintenance. They respond to crisis situations that demand immediate attention, and they schedule maintenance according to a well planned program. While crises will surely occur, urban forestry programs should strive to maximize the amount of scheduled work.

Closely related to work schedules are specifications. Because many communities have increased their use of contractors, there is a growing need for a clearly identified scope of work. Some situations lend themselves to a per unit bid and others to an hourly time and material estimate. Specifications communicate needs, form the basis of bids and serve as a standard for evaluating the quality of the completed work. In-house crews also require clearly defined expectations and objective evaluation of their work. Specifications will help them, too. When developing tree work specifications, consider the following.

Pruning Guidelines

In writing a work plan for in-house staff or contractual specifications, the purpose and scope of pruning needs to be clearly identified. Trees respond in predictable ways to pruning. By studying these responses arborists have developed pruning practices that preserve or enhance the beauty, structure, and function of trees. The Western Chapter of the International Society of Arboriculture (ISA) has developed standards for pruning that provide general guidelines. Of course, each tree has a unique form and structure, so pruning needs may not always fit strict rules. However, it is the arborist that must take responsibility for special pruning practices that vary greatly from the standards.

The following descriptions of the various types of pruning mature trees were taken from these:

Crown cleaning or cleaning out is the removal of dead, dying, diseased, crowded, weakly attached, and low vigor branches and watersprouts for the tree crown.

Crown thinning includes crown cleaning and the selective removal of branches to increase light penetration and air movement into the crown. Greater light and air movement stimulates and maintains interior foliage, which improves branch taper and strength. Thinning reduces the wind-sail effect of the crown and the weight of heavy limbs. Thinning the crown can emphasize the structural beauty of the trunk and branches, as well as improve the growth of plants beneath the tree by increasing the light penetration.

When thinning the crown of mature trees, no more than one-quarter of the foliage should be removed. At least one-half of the remaining foliage should grow from branches that originate in the lower two-thirds of the tree. Removing laterals from a branch requires a similar approach. Try to retain inner laterals and leave the same distribution of foliage along the branch. Trees and branches pruned in this way have stress more evenly distributed. Removing the inside lateral branches also produces an effect known as "lion's-tailing." By removing all the inner foliage, weight is moved to the ends of the branches, which may cause the branch structure to weaken and limbs to break. Greater light penetration may cause sunburned branches and stimulate watersprouts.

Crown reduction, also known as drop-crotching, decreases the height and spread of a tree. Thinning cuts will maintain the structural integrity and natural form of a tree, and delay the time when it will need to be pruned again. To make this type of cut, prune the branch back to its point of attachment or to a lateral that is at least one-half the diameter of the cut being made.

Crown restoration improves the structure and appearance of trees that have been topped or severely pruned using heading cuts. Select one to three main branch stubs that will grow to reform a more natural looking crown. Thinning or even heading may be required to match the weight of the new branches with the strength of their attachment. Restoration may require several prunings over a number of years.

Crown raising provides clearance for buildings, vehicles, pedestrians, and vistas by removing lower branches. It is important to maintain at least one-half of the tree's foliage on branches that originate in the lower two-thirds of the crown. This ensures a well-formed, tapered structure and uniformly distributed stress. When pruning for view, it's better to open "windows" through the foliage of the tree, rather than severely raising or reducing the crown.

Traffic Control
Take measures to expedite public passage through or around the work area and to prevent accidents, damage and injury. Tree removal should be conducted in such a manner as to insure continuous traffic flow in the street at all times.

Because trees planted in urban areas are frequently subjected to hostile growing conditions, they are not always in the best of health. Trees under stress are much more susceptible to attack by harmful insects and diseases and are more likely to exhibit symptoms of the adverse environment. The type, severity and duration of a particular insect, disease or environmental problem will vary greatly, depending upon the tree's location, climate and other environmental factors.

Here are some ideas to keep in mind when identifying problems and seeking advice on corrective measures. It is a good idea to examine trees and other vegetation on a regular basis-whether or not a significant problem currently exists. These examinations help identify problems sooner, by providing a history of the plants that serves as a point of comparison when a serious problem develops.

Fertilization and Aeration
Many street trees grow in an extremely hostile environment both above and below ground. The physical, chemical, and biological conditions of the soil may need to be managed just as elements of the trees' above-ground environment are managed. Two activities-fertilization and aeration-are the primary methods of managing this area below the soil surface. Both are vital to the health and longevity of the urban forest.

Trees need adequate amounts of nutrients, water and air in the soil. Without these elements trees will grow with less vigor and will be more susceptible to secondary problems, such as attack from insects and diseases. Properly nourished trees will be more able to withstand the attack of insects and diseases and tolerate the adverse growing environment afforded by most urban situations.

Fertilizers - Plants require at least sixteen chemical elements for proper growth and development. Three of these elements-carbon, hydrogen, and oxygen-are provided by air and water. The other essential elements are obtained by the roots from soil.

The specific fertilizers applied should be based on need. Every site is different, so soil tests should be conducted every two to three years. Cooperative Extension Services can analyze samples of soil taken from each tree site and make specific recommendations.

Trees most commonly require large amounts of nitrogen. Because it is easily leached and often volatile, it may be necessary to apply nitrogen once or twice a year. Other chemical elements, such as calcium, phosphorous, potassium, and magnesium, seldom need to be added. Acidity and alkalinity are measured on a pH scale, with lower pH indicating greater acidity. Soil pH affects the availability of certain nutrients, particularly iron and manganese, so it's important to maintain the pH between 5.5 and 7.0 for most plants.
Trees may show signs of a specific nutrient deficiency, such as interveinal chlorosis, even though soil tests indicate the presence of that nutrient. in this case, the nutrient may be present in the soil in a form that is not available to the tree. Or, nutrient uptake by trees may be inhibited by soil compaction, poor drainage or poor aeration. An analysis of the foliage may be required to determine the plants needs.

Generally, the ideal time of the year to fertilize is in the late summer or fall. Fertilizer can also be applied after leaves open fully until early July. Avoid treatment with readily available inorganic nitrogen in heavy doses between July and September, because it could cause a late flush of growth that would not harden off before freezing weather.

There are a variety of methods for fertilizing trees. Fertilizers are mostly broadcast over the surface of the ground.

Surface applications are most commonly used for fertilizers that contain only nitrogen. A properly calibrated, mechanical spreader broadcasts fertilizer over the ground in a pattern of concentric circles or linear strips beginning two or three feet from the trunk and extending five or ten feet beyond the drip line. Care should be taken to avoid excessive overlapping.

Apply fertilizer when grass is dry and then wash the grass off thoroughly with a lawn sprinkler or irrigation system. Grass blades could be burned by fertilizer that becomes slightly wet after a light rain or dew.

Aeration - Pore spaces in the soil supply trees with air, as well as water. Some soils are naturally tight. Other soils may start out well aerated, but through the actions of pedestrians, vehicles, and even water, pore spaces are compressed. Soil compaction is far easier to prevent than it is to remedy.

Preventive measures include limiting pedestrian and vehicular access, and mulching exposed soil to minimize compaction caused by the impact of rain or irrigation water.

If planting into a site with poor aeration, first rip or deep plow the soil, replace the soil with a suitable medium, or try to select trees tolerant of low soil aeration.

Mechanical aeration is possible, but at best, it's a temporary solution. Physically separating soil particles merely buys time until the pore spaces cave in again.

Tree and Stump Removal
Trees and stumps are removed for several reasons. Tree inventory information can supply a set of criteria to guide tree removal decisions. Safety is perhaps the most important reason, and considering public liability for injuries, this becomes ample justification for removal. Trees could be removed to prevent the spread of harmful insects, disease or vegetation that may be harmful to the environment. Finally, aesthetics may dictate removing a particular tree.

As opposed to pruning, removal refers to disposing of the entire tree, including the leaves, branches, trunk, stump and major roots. When removing trees and stumps consider the following guidelines.

Stumps are defined as the lower portion of a tree-up to a maximum height of four feet-that remains after the foliage, limbs, branches, and the upper part of the trunk have been cut off.

Tree Removal
The stump removal area is generally between the sidewalk and the curb, or between the curb and another curb if growing in a median strip. For trees planted in an open space, the area for stump removal is that which causes the surface of the ground to be higher than the adjacent grade. Roots within the stump removal area should be taken out as deep as 24 inches below the finished grade. This is especially true of roots that are exposed at grade and those adjacent to or growing over a curb or sidewalk. All exposed surface roots beyond the stump area should be removed to a depth of twelve inches below grade. Soil that has been displaced by deeper roots shall be leveled to the existing grade.

The hole or depression resulting from the removal work should be filled with topsoil. Do not use chips, leaves, brush, sawdust or tree debris as filler. This organic matter would eventually decompose allowing the soil to settle. Because any type of soil will settle a little over the first several months additional soil of the same quality should be added. The entire area should be made level with the existing grade.

Stump removal.
Cleanup involves removing all soil, leaves, twigs, or trash resulting from the work. Remove debris daily to approved disposal sites. Sewer systems, landfills and ocean dumping sites are not appropriate destinations for tree debris. Depending on the nature of the material, it could be used for lumber, arts and crafts, firewood, mulch or compost.

Damage to property resulting from this work should be repaired within a reasonable time. Before starting work at a new site, survey the condition of the area, including adjacent proper ties. During clean up, survey the area again to identify damage caused by the tree work. Cleanup activity may include brush chipping.

Overhead power lines pose a potential danger during removal operations. Exercise extreme caution to avoid damage to the lines or workers.