TREE CITY USA®
BULLETIN
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Editor: Dr. James R. Fazio • $3.00

How to Start Trees Off Right

The competition for space below and above ground in any community means that only through careful planning will trees live long enough to meet their full potential.

The goal for anyone who plants a tree is to have the fruits of his or her labor last for a very long time. Trees and the many benefits they provide can be our legacy. The key, however, is being aware of some basic principles that are essential for giving a tree the best chance for a long, healthy life.

The longer a tree lives and is in healthy condition, the greater its environmental, economic, and social benefits. What a shame, then, that only half of the trees planted in urbanized areas will even live 13 to 20 years on average. Short-lived trees bring disappointment and often fall short of bringing a reasonable return on the investment of planting and maintenance costs.

This issue of the Bulletin suggests a better foundation for planting trees that last long into the future. To do this, we have drawn upon the work of award-winning landscape architect Jim Urban. In his book, *Up By Roots*, Urban has condensed a wealth of scientific information and field experience into 10 principles. With his permission and that of the book's publisher, the International Society of Arboriculture, these principles are outlined briefly in the following pages. Although intended primarily for professional landscape designers, they can and should be applied by anyone who is planning to plant trees. For greater detail and elaboration on each principle, we enthusiastically direct you to *Up By Roots*.

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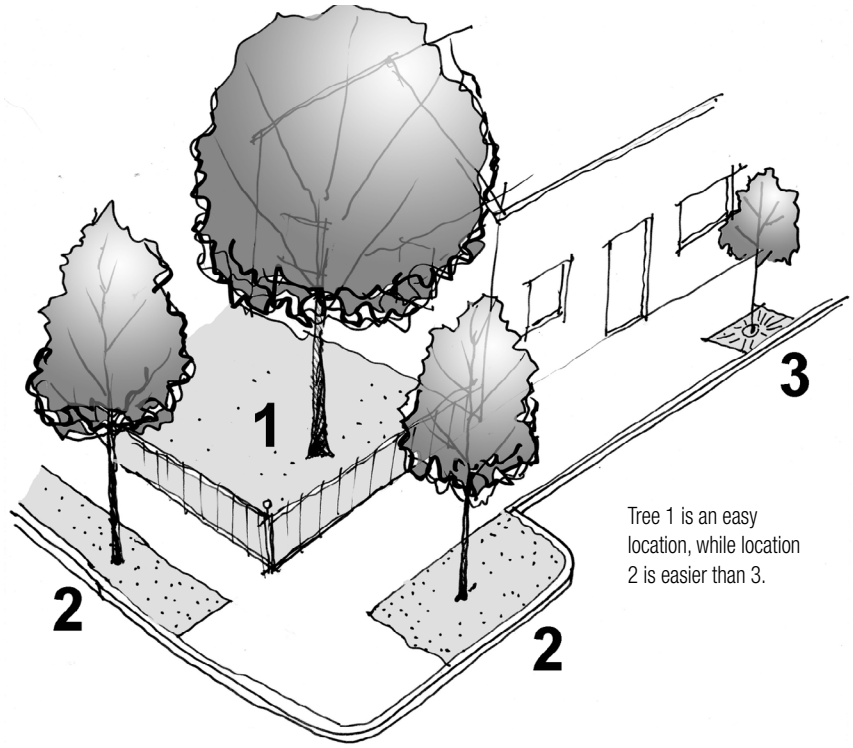
10 Principles for Successful Planting

"To ensure that each tree gets its needed share of space and budget, the designer must defend tree requirements from the beginning of design through the end of construction. Designing space for trees … cannot be an afterthought." – Jim Urban

PRINCIPLE 1: *PLANT THE EASY PLACES FIRST*

When there are options available, plant where the trees will have the best chance for growth and long-term health. Urban points out that a single tree in an easy place can have greater impact than a row of declining trees in difficult places.



Tree 1 is an easy location, while location 2 is easier than 3.

- Look for areas with the least compaction and soil disturbance.
- Consider clustering trees in the best available planting locations.
- During construction projects, protect the soil of planting sites.
- In open areas, low curbs or fences can be used to keep pedestrians off planting soil.
- Avoid turf when possible or protect young trees with a 6- to 8-foot diameter mulched area.
- Avoid filling gaps in difficult places with additional trees for the sole purpose of creating a particular visual rhythm.
- Do not plan formal rows where some trees have more root space or other better conditions than others; they will always grow at different rates.

PRINCIPLE 2: *MAKE LARGER PLANTING SPACES*

Depending on the size of the tree to be planted, a reasonable minimum space is 20 feet in diameter. Unfortunately, such space is often simply not available in an urban setting. More details are provided in Principles 5 and 6, but the key points here are: (1) space for trees should be considered at the same time sidewalks are designed, (2) paving should be kept to the minimum needed for its use, and (3) flexibility of design geometry should trump consistency.

Providing the maximum space for trees in an urban area requires the minimum space needed for other uses

PRINCIPLE 3: *PRESERVE AND REUSE EXISTING SOIL RESOURCES*

Soil is the key to sustainability. Protecting the soil is essential for tree health and longevity. Protection is necessary from compaction, grading, filling, chemical and silt contamination, loss of organic material, and changes to drainage patterns. Protection of good, native soil is ideal, but there are also numerous techniques for removal-storage-and-reuse or amending poor soil. However, the first essential is recognition of the importance of soil and the will (and budget) to keep its texture and chemical composition from deteriorating.

Soil preservation requirements are similar to those needed for tree root protection, but harder to enforce, especially if there is no tree on the site nearby or yet planted to serve as visual rationale.

WHAT IS A PRINCIPLE?

A principle is a guideline — a general direction applicable in a wide range of situations. Specific application of a principle will vary according to circumstances such as location, site conditions, available funds, and many other factors. Up By Roots *is a primer on tree biology, roots and their needs, and the physical and chemical properties of soil. The principles presented here are based on the science of these factors.*

10 Principles for Successful Planting (continued)

PRINCIPLE 4: *IMPROVE SOIL AND DRAINAGE*

"As the volume of available soil becomes smaller, the quality of the soil becomes more important to the tree's long-term success. Working with existing soil should be the first option (Principle 3), but replacing this soil with imported topsoil or soil mixes may be a reasonable, or even preferred, choice." – Jim Urban

This is the longest section of Urban's book, and it is rich with suggestions and illustrations. In all cases, the prescription for soil treatment depends on the specific site and its condition, along with recommendations from experts. There are no shortcuts or recipes, but important techniques include:

SOIL AMENDMENTS

- Organic material can be added if it has stable texture. Examples include well-composted bark, yard wastes, sewage sludge, agricultural byproducts, etc. Biological organisms can also be helpful, primarily mycorrhizae, to supplement naturally occurring symbiotic fungi. However, the common recommendation of one-third organic material by volume is too much. Also, peat, although inexpensive and easy to obtain, is a poor choice because it does not provide good textural improvement and it oxidizes rapidly and results in soil shrinkage.

- Mineral amendments can improve drainage and reduce compaction. Examples include coarse sand, perlite, diatomaceous earth, polymer gels, etc. However, simply loosening the soil and adding small amounts of compost typically gives better results than mineral amendments.

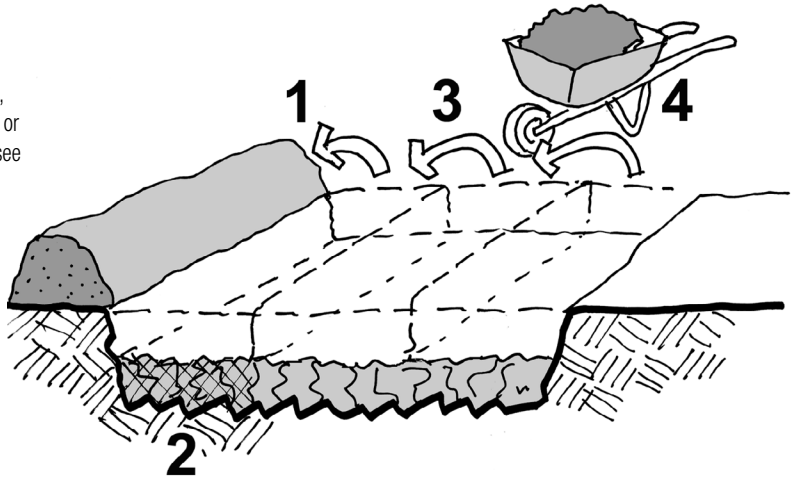
COMPACTION REDUCTION

Compaction is the most common and damaging soil problem. The solution usually requires deeper treatment than simple tilling. Among the many available techniques, the most effective include subsoiling with large equipment and long chisels or the use of trenching apparatus. Another is fracturing with compressed air with immediate injection of solid materials into the fractures. If these methods are not practical, double spading can be used.

OTHER TREATMENTS

Depending on soil analyses, pH may need to be modified, most commonly by lowering the pH to below alkaline levels. Soil mixes go beyond simple amendments and are high in prescribed quantities of organic or inorganic materials. The advantage of mixes is the ability to address more factors such as compaction control and drainage. A wide range of drainage methods are also important parts of Principle 4. Urban's experience is that testing and adjusting soil to improve plant performance is a relatively new practice and, as a first step, requires commitment by the property manager if it is to succeed. He adds that since the publication of his book:

"For imported soil, I have moved towards recommendations that allow a very wide range of soils, including the B and C horizons that are not screened and only amended with small amounts of compost and occasionally small amounts of coarse sand loosely folded into the soil with a loader bucket — not a blending machine. I now endorse, for tree planting soil, the use of otherwise poor quality, unscreened subsoils — even clay soils and soil with up to 15 percent construction debris — with small amounts of compost added."



Double spading is an effective method of breaking up compacted soil. Closer to trees, air excavation and vacuum may be needed, or easier methods such as vertical mulching (see Bulletin No.5) or radial trenching.

PRINCIPLE 5: *RESPECT THE BASE OF THE TREE*

Almost every community has examples of the base of trees either being damaged by adjoining pavement or, vice versa, damaging sidewalks. This avoidable error is due to the tendency to pave too close to the base of newly planted trees. One remedy is to plant trees that mature small enough to fit available space. However, because of the greater benefits provided by large-maturing species, methods should be explored that allow them to be planted where possible in urban settings.

The problem in this case is made worse by a cut of the trunk flare, risking stability and health of the tree.

One of many solutions — loose-laid pavers that can be removed as the tree expands.

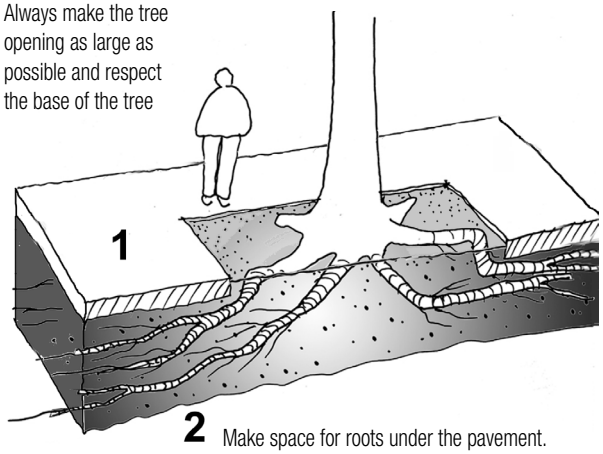
TIPS FOR COMPATIBILITY

- Design or retrofit pavement taking into consideration the expected trunk flare at maturity.
- View the space between trunk and permanent pavement as earth that will become wood over the next 20–40 years.
- Most tree grates damage trees. Avoid them and use alternative methods.
- The same goes for tree guards.
- Use curbs and low barriers around the tree opening to control salt and pedestrian intrusion.
- Keep conduit-wired electric junction boxes out away from the tree's future trunk flare.
- Route underground irrigation pipes and other utilities around the area of future root flare.

PRINCIPLE 6: *MAKE SPACE FOR ROOTS*

Absorbing roots seek out conditions that provide them with the air and water they need for growth. If not provided for otherwise, these places are likely to be cracks in pavement. There, the roots will expand and sidewalks are damaged. The best control is to provide adequate space where urban trees can grow without causing damage. Jim Urban's sixth principle provides guidelines for the use of adequate soil volumes, or at least the most soil that budget and other circumstances allow. Low soil volumes result in slower growth, smaller trees, and shorter life expectancy.

Always make the tree opening as large as possible and respect the base of the tree



Make space for roots under the pavement.

OPTIONS FOR CREATING SPACE FOR ROOTS

- Root paths under pavement — narrow, 4-inch wide by 12-inch deep trenches filled with strip drain board and loam topsoil.
- Soil trenches, or larger versions of root paths. Best results are when the paths or trenches can be joined between trees.
- Soil vaults. These are subsurface expansions of the above ground tree space.
- Structural cells (see Bulletin No. 3).

WARNING: *Design and construct facilities to divert silt and salt drainage away from soil vaults and other spaces provided for tree growth.*

10 Principles for Successful Planting (continued)

PRINCIPLE 7: *SELECT THE RIGHT TREE*

As invading tree pests spread across the country, the list of trees traditionally used in urban plantings is shrinking. Providing adequate soil for roots is one way to expand the palette of trees suitable for urban settings. In all cases, careful selection of good root and branch structure is essential for successful planting.

Numerous guides are provided to help match the right species or cultivar with climate and site conditions. However, nothing tops local knowledge. Observing performance in the community or a nearby arboretum is the best way to learn about unfamiliar trees. Purchasing trees from a quality nursery is also important.

TYPICAL SELECTION CRITERIA

- Cold and heat hardiness
- Insect and disease vulnerability
- Light or shade requirements
- Soil characteristics
- Fall color and other aesthetics
- Soil drainage needs
- Salt tolerance
- Air pollution tolerance
- Wind stability
- Size and form
- Acceptable levels of pollen, volatile organic carbons, and litter (fruits, etc.)

THREE MORE IMPORTANT QUESTIONS AND A 'DO'

- Which is more important to the planting situation — uniformity (monoculture) or diversity?
- Which serves best — native species or exotics, and should an invasive be avoided?
- What is the best spacing given the soil that is available, anticipated tree size, and purpose?
- Do have patience and anticipate how the tree(s) will change with time. Planting the "instant landscape" requires larger-caliper trees (e.g., 5-inch caliper). This works against diversity because the selection of available planting stock is less and the tendency is to plant too many trees and too close together. A 3- to 4-inch tree is the optimal size for planting in an urban setting.

PRINCIPLE 8: *ESTABLISH REASONABLE TREE AND SOIL BUDGETS*

Application of the principles that lead to planting success is dependent on having adequate funds to do the work. Awareness of budget limitations at the outset of a project will lead to lower-cost alternatives being developed without sacrificing tree health. On the other hand, cost cutting after the project is planned usually leads to undermining the rationale for other decisions, fundamentally changing the potential for success.

Convincing property owners or decision makers about the value of getting trees off to a good start is not easy. The tendency is to look only at planning and installation costs and not the long-term benefits of "doing it right." For example, compare the value of a 3.5-inch willow oak, in good condition, planted in a residential front yard and appraised using formulas of the Council of Tree and Landscape Appraisers:

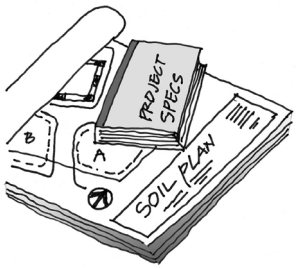
Good soil conditions: At maturity, the tree is 30 inches in diameter, in good condition, and appraised at $24,300 (plus its maximum eco-benefits)

Poor soil conditions: At maturity, the tree is 10 inches in diameter, in poor condition, and appraised at $1,170 (with far fewer eco-benefits).

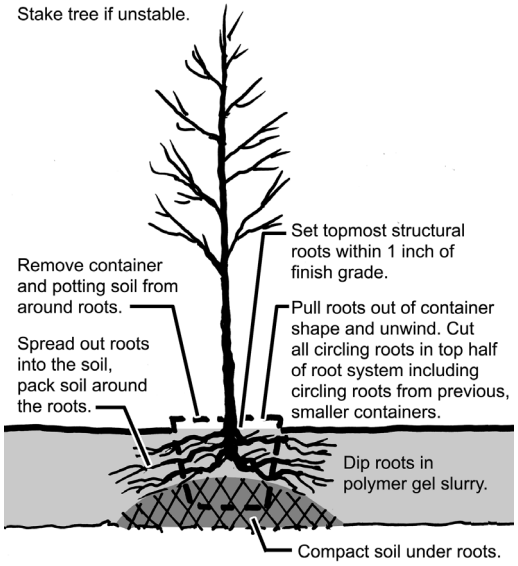
Importantly, a tree's social and ecoservices must be considered in offsetting initial and maintenance costs. Tools such as the i-Tree programs help quantify these benefits and can place community trees in a better position to compete for funding. Invariably, the balance sheet is in favor of trees that are planted in ways that follow the principles outlined in this Bulletin.

PRINCIPLE 9: *CREATE DETAILED TREE AND SOIL CONSTRUCTION DOCUMENTS*

Two major challenges to shepherding a planting project to successful completion are control of construction documents and specific planting details.



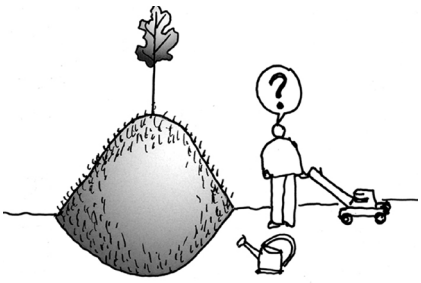
The best laid plans to control the planting site can be obliterated without the cooperation of the architects and engineers who have responsibility for their own plans. Jim Urban has found that without single-consultant control of all parts of the planting/grading/soil/drainage equation — or a collaborative culture among the design team — omissions or different priorities may create conditions that lead to tree failure. Professionally prepared plans, with separate documents for soil/grading/drainage and planting, can help emphasize the importance and improve the implementation of both.



Another sure way to uncover and correct defects in container stock is to wash off the soil to expose the roots before planting.

Planting details should be specific to the tree(s) being planted and the site. There is no single standard, and containerized trees should be treated differently than bare-root stock. In addition to planting details, a plan should specify the kind and condition of nursery stock, its handling and preparation, inspections, and post-planting treatments such as staking, watering, mulching, and trunk protection.

PRINCIPLE 10: *DESIGN FOR MAINTENANCE*



How many times do we applaud great landscape designs that simply cannot be maintained, then blame lack of maintenance for the project's failure?

All too frequently trees are planted and landscapes are designed with little or no thought to the routine care needed when the project is completed. Jim Urban points out that designers must adjust their plans to fit the expected maintenance. If only occasional pruning can be expected, a tree needing frequent pruning should not be planted. If mounds or swales are used adjacent to turf, accessibility to mowers should be considered in the grading and edges.

SOME IMPORTANT QUESTIONS

Answers to these questions will help guide planning and installation of trees and ultimately ensure long-term success.

- Is there commitment for maintenance at the top of the organization or by the owner?
- What is the owner or manager's maintenance history?
- Are maintenance people included during the planning stage? Note: They should be!
- Is there opportunity for the project designer/ planner to sustain a relationship with the owner after the project is completed?
- Are there maintenance provisions for rooting soil under the pavement (inspections, tests, corrective actions)?
- Are there provisions for replenishment of settled soil, plant replacement, and removals when growth gets crowded or unwanted shade develops?

Meet Jim Urban

Jim Urban, author of *Up By Roots*, has combined his knowledge of landscape architecture, urban arboriculture, and soils to become a leading proponent of planting for long-term sustainability. He has helped pioneer the development of Silva Cells and other techniques to provide growing space for roots even in densely developed urban areas. Urban received his Bachelor of Landscape Architecture degree at the SUNY College of Environmental Science and Forestry at Syracuse, New York, and is currently principal in the firm that bears his name. Jim has lectured about trees and soils throughout the world and is the recipient of the Medal of Excellence presented by the American Society of Landscape Architects and the Award of Achievement from the International Society of Arboriculture. His motto: *Every project needs a Lorax*.

FOR MORE INFORMATION

Please visit **arborday.org/bulletins** for quick links to additional information.

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