

## CREATIVE SITE PLANNING - ALTERNATIVES

by James C. Patterson  
Research Agronomist  
Center for Urban Ecology  
National Capital Parks  
National Park Service  
Washington, D. C. 20242

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**ABSTRACT.**--Urban soils present unique challenges to the urban ecologist and landscape architect. Urban soil, into which plants must extend their root system to obtain nutrients, air and water, are often hostile environments. These soils have been created by mass manipulation of natural soil, geologic materials and urban debris. The urban plantsman must be at his creative best to provide a suitable medium for urban plantings.

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Urban centers have become the focus of extensive landscaping projects. Many projects and plantings have been successful; however, many others have failed to meet their objective and their plants exhibit the effects of severe stress. In the majority of observations made by the Center for Urban Ecology staff, initial plant stress is related to the site and specifically the soil. Too often, the soil is assumed to be capable of supporting selected plants and little detailed site information is collected to assess its quality. The site, as referred to here, includes the above and below ground attributes of the proposed planting location.

About 50% of the volume of any plant is beneath the soil surface. An effort must be made to sample the soil and observe its profile to assess quality. However, thorough examination of a soil pit is rarely conducted. Most often, the landscape design is completed and the vegetation planted in a hole slightly larger than the root ball. Once the root ball is placed into the hole, a "select backfill" is usually placed around it. In essence this creates a Bonsai or tea-cup situation since surrounding site soils are often inhospitable to nursery grown plants. Should growth continue at the new site, the transplant's roots become pot-bound resulting in reduced plant vigor or the plant simply dies because the select backfill becomes waterlogged. This planting situation results in a very complex soil physical situation. Three distinctly different soil types may be placed adjacent to one another. First, the site soil is often the most inhospitable and restrictive. The second material, the select backfill, is specifically designed to provide nutrients and porosity. The third soil exists within the plant rootball and usually contains an abundance of organic matter and a lightweight aggregate to enhance moisture retention. The resulting textural

differences between the three soil materials are strongly contrasting and there is little continuity of soil pore space. The interface between two contrasting soil types becomes a barrier to water and air movement. As a result, the soil that is most porous will tend to saturate first and water will not migrate into the next most permeable soil until the first approaches total saturation. A complex soil air and water balance results creating a compromising situation for the transplant. As urban plantsmen we must be aware of these conditions and alter our planting schemes accordingly. In most instances, the recommended planting scheme is a slight modification of the existing soil rather than use of the select backfill. Other alternatives are suggested later.

**SITE ASSESSMENT.** It is critical that urban sites be evaluated prior to planting to determine if the soil can be used as it occurs. Can it be used with slight physical or chemical modification or must it be replaced? It is, after all, the site soil from which the plant must ultimately derive nutrients, air and water. A quality soil environment is imperative to the ultimate success of the urban planting! Prior to planting is the best opportunity to alter a poor soil situation.

The landscape architect must visit the proposed site on several occasions and consult with an agronomist to determine if the soil is suitable for the selected plants. Some soil testing may be advised to substantiate field observations. The agronomist can suggest methods to modify the existing soil to provide the necessary plant nutrients and physical environment to sustain a vigorous planting. If this consultation and evaluation is not held and the planting completed, there is little that can be done to correct a poor soil situation without major disruption of the planting and inflicting damage to recently established root systems. The variability of the soil materials and the mixed history of urban sites make it essential that sites be evaluated individually. Because history and use can differ considerably, one site may require more extensive analysis and costly modification than another.

There are several conditions that can guide the decision making process regarding soil quality.

1. **What is the historical use of the proposed site? Might the site require special treatment and management because of past utilization of the site? Were toxic or potentially toxic substances manufactured or deposited at the site?**
2. **Soil wetness and standing water will present a serious problem for vegetation and must be addressed. Water easily enters a soil profile but may be very difficult to remove from the subsoil. If gleyed or mottled soil conditions are observed in the profile, subsoil wetness will be a periodic problem**

**In many situations a subsurface drainage system is recommended as an insurance measure. Such a system is easily installed during construction.**

- 3. Some provision should be made for supplemental watering.**
- 4. If during excavation dense soil horizons or layers are encountered, some soil amendment or soil modification will be necessary to alleviate compacted conditions. Dense soil horizons can restrict vertical and horizontal soil, air, and water movement and prevent root growth.**
- 5. Widely contrasting soil materials result in poor conditions for plant growth. Extensive manipulation and/or replacement of the soil medium is usually necessary for long term survival of transplants.**
- 6. The preferred soil medium is a homogeneous blend of material to meet the physical and chemical requirements of the selected plants.**
- 7. Shared or grouped planting beds offer significant advantages over individual tree pits. This planting technique has found wide acceptance in many urban areas.**

#### **URBAN SITE MANAGEMENT**

**Human impact on plants is often the most serious stress plants must endure. The objective of most urban landscape projects is to enhance aesthetics of a site. The attractiveness of a site becomes the source of its greatest impact: excessive visitation. Forethought in design is important to create both attractive and vigorous plantings, and to mitigate the impacts that result from public utilization and enjoyment. A number of factors may have bearing upon the design and should receive consideration.**

**If heavy visitation is anticipated, perhaps special features should be included in the design to channel the visitor traffic. There are excellent examples expressed at Walt Disney World in Orlando, Florida; Hyde Park in London, England; Saint Stephen's Green in Dublin, Ireland; and the city parks of Athens, Greece. In each instance some physical barriers have been used to direct visitors around rather than through plantings. In England and Ireland there are specific regulations which govern use of the parks and these are posted at the park entrance.**

**In each of these locations subtle devices have been used to suggest that visitors restrict themselves to the walkways. Some of these devices are low metal fences or curbs about six inches in height. In Washington, D. C. the National Park Service has successfully used post and chain to**

direct visitor traffic around rather than through sensitive areas. At the Vietnam Veterans Memorial the solution has been a thin chain supported by small metal posts to suggest access routes.

Each of these techniques has limitations but can be effective to direct traffic. Often the objective is not exclusion, rather to channel 50 to 60% or more of the visitor traffic around an area. Casual use of the protected area is often permitted.

Some design concepts are particularly attractive to visitors and, because of the expected volume of visitors or overflow parking, a substantial effort must be made to protect soil and plants from adverse impact. Porous pavers can provide a means of distributing weight over the soil surface and thereby reducing compaction and maintaining conditions for plant survival. There are a great number of commercially available porous pavers. Grid pavers may be constructed of plastic rings attached to a plastic netting, interlocking plastic honey comb panels, cinder blocks, or, preformed high strength concrete grid pavers. They vary in size, shape, weight, surface characteristics, percent open area, and runoff characteristics. These materials, properly installed and maintained, can provide an excellent alternative to allowing unrestricted visitation and yet provide soil conditions suitable for plant growth. Installation of these materials is particularly important to achieve the design function.

Perhaps the most drastic and least desirable option for any site is solid pavement. However, there are instances where it is the only alternative. To allow heavy unrestricted use of the area will, because of the volume, preclude plant survival. It is important to recognize that pavement and plantings can be used effectively. As noted, Walt Disney World provides many fine examples.

#### CREATIVE SITE PREPARATION

To develop a site without considering the soil requirements of the selected plants is a serious omission. Considerably more time must be spent in planning and money budgeted to meet the subsurface requirements of urban plantings. The landscape architect who considers and supplies an appropriate subsurface planting medium will realize a more vigorous planting and likely the desired long term landscape benefits.

A number of alternative planting techniques seem appropriate for urban planting schemes.

**INDIVIDUAL TREE PIT.** The street-curb planting pit is often too restrictive for many tree species selected for these locations. Also, these sites have been subjected to the insults of urban expansion and reflect a soil system designed to support walks, roadways, buildings, and not plants!

If a plant must be placed at a site where it will be subjected to stress, some important considerations apply. 1) From the perspective of plant survival, it is best to plant smaller stature cultivars which are better able to tolerate confined growing conditions. 2) Plant the tree higher than the surrounding grade and provide for excess moisture removal from the bottom of the planting hole. This can be accomplished by providing positive drainage to a sewer protected by a back flow protection device, or sometimes by augering a hole to deeper porous subsoil in the bottom of the tree pit. The hole should be backfilled with coarse gravel. 3) Try to provide a curbing around the edge of the planting hole to prevent overwash from the surrounding paved areas and entry of deicing salts. Another technique to achieve this relief is to ramp the sidewalk up to the edge of the tree pit on all sides. 4) Use the site soil or a slight modification thereof for backfill because this is the soil into which the tree's root system must ultimately extend. 5) Make the tree pit as large as possible to allow maximum space for lateral root growth. In some situations the soil pit walls can be flared at the surface to provide additional space for lateral root extension.

**SHARED ROOTING SPACE.** This concept can have a great number of configurations. The objective is to provide a much larger rooting area to accommodate several plant species in a group effect (Figure 1A). The shared space may be at grade, above grade in the form of a mound, or an above ground walled planter. The important aspect of this planting technique is to provide a greater volume of rooting medium which is shared by several plants. A blend of soil materials to meet the needs of the selected species is thoroughly mixed off-site, then transported to the site and placed uniformly into the shared space. Subsurface drainage is recommended and should be in place prior to the soil mixture. The soil should not be compacted or manipulated once placed in the planter. Irrigation could be handled by use of a "quick coupler" or a sprinkler system. The unrestricted soil depth should be an absolute minimum of three feet for trees, eighteen inches for shrubs and eight inches for turfgrass.

It has been observed that plants in a shared rooting space afford one another protection from exposure and impact, provide a pleasing landscape because of their mass, and are generally more vigorous because of the improved and expanded growing conditions.

The shared rooting concept can follow a linear pattern paralleling the curb-sidewalk (Figure 1B) or be accommodated underground by a cantilevered sidewalk above a prepared soil mixture. Pennsylvania Avenue Redevelopment in Washington, D.C. is an excellent example.

Another alternative for use along a street would be to set aside designated parking spaces for use as tree spaces. One entire parking space would be allocated to a shared rooting space. It may be desirable to elevate the sides of the planter to preclude runoff water and accumulations of snow from entering the plant zone.

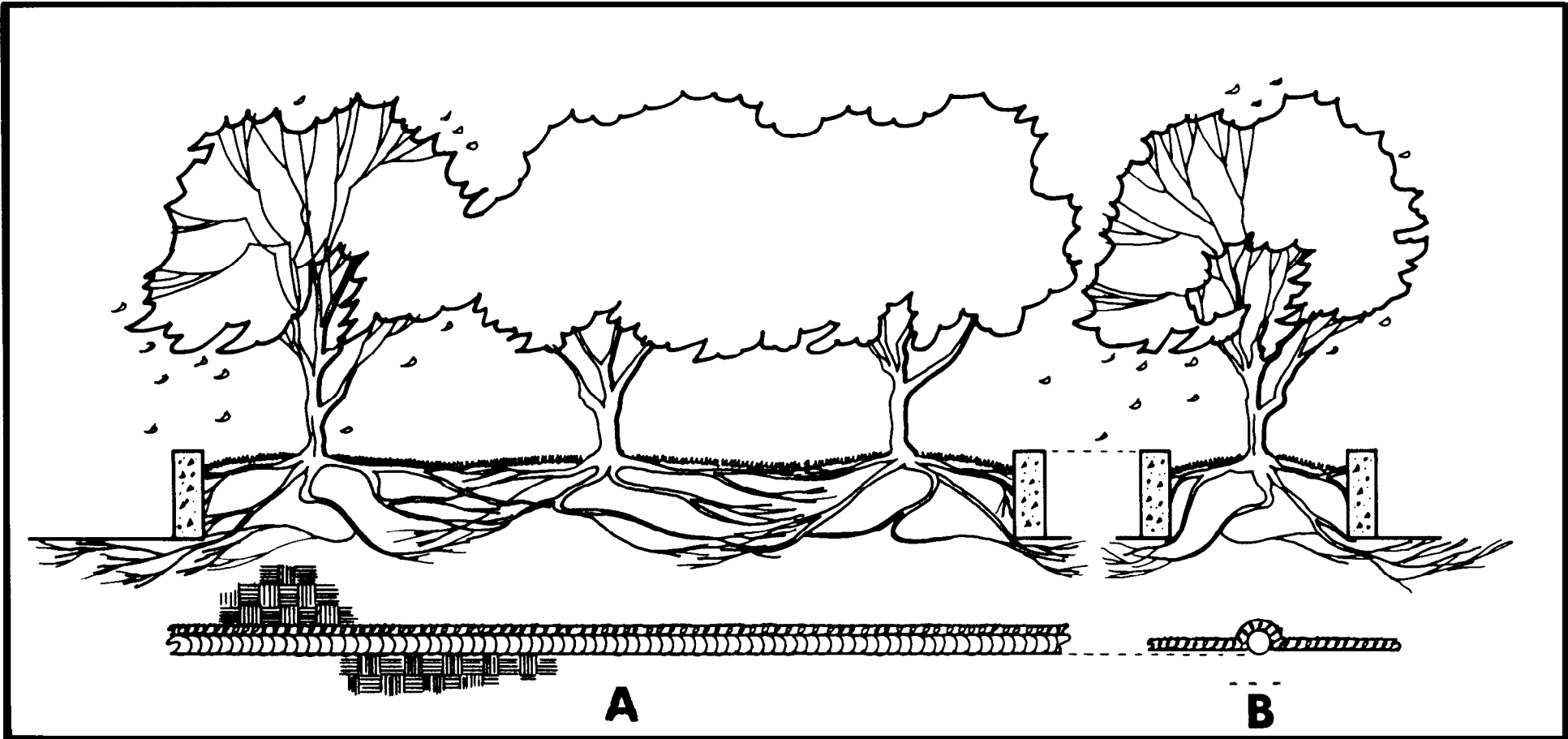


Figure 1A. Trees in an above ground walled planter share a substantial volume of soil. A drainage line speeds the flow of excess water from the soil beneath the planter.

1B. The shared rooting concept can follow a linear pattern paralleling the curb. Drainage is provided.

For parking lot situations, an at-grade or in-ground planter may serve the need. The edges of the planter box can serve as automobile wheel stops. The planter box could assume a diamond shape and accommodate diagonal parking. Thus, a larger tree pit is provided, perhaps as large as twelve feet on a side, and tree survival should be enhanced.

There are a number of alternatives available to deal with complex soil and plant situations which exist in the urban area. Site assessment and selection of appropriate planting techniques are important to achieve the desired landscape results. Each site offers its own set of problems which must be addressed to effect a lasting landscape design.