THINK BEFORE YOU PLANT: SELECT THE PROPER PLANT[1]

by T. Davis Sydnor

Many problems in the landscape can be reduced or eliminated by proper plant selection. A number of factors must be considered in order to insure that the proper plant is placed in a specific site. In general, these factors are divided into three major categories, which include design, site, and maintenance considerations. The best approach to this type of choice is to get out a piece of paper and outline the factors that you wish to consider. I will go through some of the items you may wish to consider. The list is by no means all inclusive and you will want to modify the list to suit your needs.

Design Considerations

Landscape architects, of course, have spent years, indeed lifetimes, studying the various design concepts.

Engineering. Plants can serve quite a number of engineering functions. Plants can serve to direct traffic by guiding people in desirable traffic patterns. Plants can be used to prevent erosion on slopes. Trees and large shrubs can be used as crash barriers or to intercept headlight glare and reduce the amount of reflected light. These are just some of the engineering uses one might encounter. Each of these factors may or may not be important for your specific site.

Architectural

Trees and shrubs can be used to define space by providing an overhead canopy or by taking up space which will later be an architectural feature. Plants can be used to gradually unfold views to screen undesirable views. These are examples, of course, where trees and shrubs are being used as architectural features, such as walls, doors and ceilings.

Aesthetic. When we think about aesthetic use of plants, we think about "normal" uses of plants. Often people are unaware that plants can serve other functions and only consider aesthetic features. However, aesthetic features can be extremely important and may very well warrant consideration. Some additions to your list you may wish to consider are the use of trees and shrubs to enframe a building, to enhance architectural styles and lines, to hide architectural flaws, and to provide background. Trees, of course, can be used as living sculpture. Plants can work to unify a site and to bring natural elements into the austere, man-made, environment of the city. Finally, trees and shrubs can act to attract wildlife by providing food and shelter for birds, squirrels and similar animals.

Climate control. Only recently has consideration been given to the potential of plants to modify climate. We have intuitively taken advantage of these assets, but only in the last ten years have we made a conscious effort to select plants for this kind of use. Plants modify temperatures under the plants by intercepting light and by intercepting reradiated heat in the evening. This is particularly important on a clear cool night. Trees can intercept and divert rain, sleet, snow or hail. Trees, and in particular, deciduous trees, can lower air conditioning costs in the summer and lower heating costs during the winter months by intercepting radiant energy in the summer and allowing it to pass in winter. Evergreens and shrubs make excellent snow fences, which increase effectiveness as the years progress. Soil temperatures, of course, are considerably cooler when covered by vegetation, such as trees, shrubs or ground cover. Opportunities for using plants in this manner are just now beginning to receive the consideration they deserve. With increasing energy costs these kinds of things are more likely to be important.

Site Consideration

Site consideration in a sense can be broken into three sub-headings which include conditions of the soil and air, as well as the physical space

[1]Presented at the annual conference of the International Society of Arboriculture at Boyne Falls, Michigan in August 1981.

which is available for the plant.

Soil conditions. Quite a number of conditions in the soil will alter our choices. Soil pH, for example, will dictate which plants will do well. As a general rule, as soils increase in alkalinity above 7.0 the choice of plants becomes more and more limited. For example, pin oak from certain seed sources are very intolerant of alkaline soils.

The overall nutrition of a site can dictate plant choices. For example, in the mid-West beech and sugar maple occur on areas of high nutrition, while some of the pioneer invader species, such as black locust and red cedar will tolerate much lower nutrition levels.

Soil contaminants are a major consideration in many urban sites. Contaminants may include herbicides used to kill unwanted vegetation as well as contaminants which are needed for human safety such as road salts.

The soil bulk density is probably the best measure of the amount of compaction which has occurred. The effects of compaction are well known. It may severely limit plant choices. In a very general way pioneer invader and flood plain species tend to be more tolerant of compacted soils. Areas subject to periodic inundation or flooding and soil compaction are both subject to low oxygen levels within the root zone.

The organic matter of the soil in the given site can also dictate plant choices. Organic matter modifies the nutrition availability, density, soil pH, and naturally occurring nutrient levels.

Soil temperatures are vastly different in an urban situation than they would be in a rural area. Increased soil temperatures can be experienced both summer and winter in most urban sites. The soil temperatures may actually be colder, particularly where soils are compacted, as frost will penetrate compacted soils more rapidly and to a greater depth. Where trees were subjected to higher temperatures during the summer and colder temperatures during the winter, even greater stress might be expected. Plants such as the canoe or grey birch could conceivably be affected by such fluctuations in soil temperature.

The moisture level of a particular soil will also affect plant choice. Careful attention must be paid to the amount of moisture which that particular site will receive. General terms, such as drought tolerant, are meaningless in many instances. Drought in Richmond, Virginia means 30" of rain per year, while drought in Denver, Colorado means less than 10" of precipitation per year. You must define what you mean by the term drought tolerant and specify plants which will meet your criteria.

Air conditions. The physical characteristics of the air around the planting are equally important to conditions in the soil. Generally speaking, the lowest and highest temperatures of the year will influence which plants will survive and which will not. In most areas of the United States, the lowest temperature of the year is probably more important than the highest temperature of the year. Don't guess when trying to determine these kinds of things. The local weather station information tends to be considerably more objective in the recollection of temperatures. Both the average low and the absolute low are important. If trees are subjected to near lethal temperatures for protracted periods of time, often times stress related diseases, such as Nectria canker will result. Very unusual drops in temperature to lethal conditions are much more dramatic and therefore, more easily understood.

Light levels in a given site are also extremely important for specific plants. Often times light levels on the south side of white or glass-fronted buildings will be considerably higher than naturally occurring radiation levels. Under these kinds of conditions, light levels may be twice normal levels. Sun scald on trunks and leaves can result from high light levels.

The air quality of a site may very well dictate plant choices. Considerable attention in recent years has been given to reducing carbon monoxide levels by governmental agencies such as E.P.A. This has little effect on plant growth. Of particular importance to plants is sulfur dioxide levels. Sulfur dioxide levels have not decreased over the past ten years and are expected to increase dramatically during the next ten years. Considerable attention must be paid to this particular pollutant, as it is much more dangerous to plants than it is to humans. Because of human tolerance to this pollutant reduced interest can be expected of governmental agencies.

Trees will be subject to wind, snow and ice

loading. Again, your local weather station will be a source of information here. Care must be taken to select plants which will tolerate a reasonable amount of storm loading. Present concepts of weak-wooded and strong-wooded trees are dangerous, at best. Habit of growth, crotch angle and surface areas of branches are at least as important as wood density, a commonly used measure of wood strength. No reliable information is available in the literature about this question.

Special limitations. Care must be taken to use a plant which will live within the dimensions present at that particular site. Available space is normally dictated by the site. Rarely will the designer have the latitude to influence this. While large growing trees can be restrained by pruning, this is an extremely costly procedure, not without risks of its own. Care must be taken to consider both the above ground space as well as the below ground space. Often we do not consider underground utilities which are found with increasing frequency, particularly in urban sites.

Maintance Considerations

This is something which the municipal arborist or urban forester must consider and define for themselves. Again, these kinds of things are often forgotten, thus should be written down for reference when needed. Maintenance considerations may also change dramatically in very short periods of time. The best we can hope for is an educated guess as to what your costs will be in the future.

Service life. All trees have an expected service life. It is popular to consider trees as immortal. This is simply not the case. Trees are biological entities, and as such, germinate, mature, age and die. It is important, I think, that the idea of service life be sold with the trees. A short service life is not a condemnation, as there are situations where short lived trees might actually be desirable. For example, one may wish to plant short lived trees between longer lived trees. When the short lived trees die, the larger trees will be better spaced. Short lived trees also have the advantage in many instances of being more rapid growing, particularly while young. This is not a new concept but is one which could be employed to the advantage in many situations. In other instances, one may specify that the tree have a normal service life of 20 to 50 years. Service lives greater than 50 years are of little value in most urban sites, as cities change rapidly enough to make longer service lives of no value.

Labor. The amount of labor which one has available will dictate whether or not certain plants can be planted. Labor is at least a partial substitution for equipment and vice versa. A number of cities have more labor than capital investment monies while others can get capital investment monies more easily than they can obtain long-term commitments for labor budgets. One should have a good idea about the long term budget such that trees with higher than average maintenance requirements can be avoided if lower budgets are anticipated.

Capital. In many instances we find that capital monies can be obtained more easily than labor. As a general rule, telling the budget director that you need $50,000 for a truck is likely to receive a more favorable review than a request for $10,000 a year for each of five men. Equipment will be available on Monday mornings, while labor can find this difficult or perhaps impossible to accomplish. If capital monies are available to provide the equipment which will allow trees to be maintained with your present labor force, plant selection to reduce maintenance costs may not be as important as if these costs are limiting.

Genetic tolerance. Genetic tolerance is becoming an important part of integrated pest management strategies which are being substituted for the old "spray and pray" management techniques of ten years ago. Even where labor and equipment is available, spraying may be politically unwise. A list should be made of the insect, disease, mechanical and environmental problems a plant might encounter in a specific area. Where genetic tolerance is present it is usually the lowest cost way to overcome the problem. In Columbus, Ohio, for example, the city forester determined that the cost of spraying a ten inch tree in the city of Columbus was only slightly less than replacing that tree with a 2" tree of greater disease resistance. Granted, a two inch tree is considerably smaller than a ten inch tree, which is the average size tree for the city, however, no cities can afford the luxury of spray-

ing trees and shrubs several times per year.

The Final Choice

Once you have your requirements put down on paper, you are ready to proceed to the next step. It is important that the requirements be put on paper. It is amazing how frequently one will subconsciously drop specific requirements in order to justify planting one's favorite tree or shrub. If the requirements are in writing it is considerably less likely that they will be forgotten.

The next step is to take these requirements and list them in order of their priority. The most important requirement would be first, second most important requirement next, and so forth until you have all of your requirements in order.

List the number of plants which will meet the first requirement. Now you have a list which will meet the most important requirement. From that list choose plants which will meet the second requirement. From the remainder choose those which will meet the third requirement, and so forth, until either the list is reduced to a manageable level or you run out of plants, whichever comes first. In much of the United States we are fortunate in having a tremendous wealth of plant materials from which to choose. In many instances a number of requirements can be met and still you will have a reasonable plant selection from which to choose. It is important to remember that there are no trees which are inherently good nor trees which are inherently evil. There are only good plant selections and poor plant selections. However, the failure of a plant to function properly in the landscape is an error in human judgment and not the result of a wicked plant wreaking havoc on mankind.

Department of Horticulture
Ohio State University
Columbus, Ohio

ABSTRACT

Feucht, James R. 1982. **Knowledge of root functions aids transplanting.** Am. Nurseryman 155(3): 77-81.

Transplanting always results in some injury to the root system and should be counteracted with measures that will reduce transplant shock. These measures include pruning the top and using antitranspirants, both of which help to reduce the water deficit created in the plant when roots are cut. Top pruning and use of antitranspirants can be overdone. This causes an interference or reduction of the photosynthetic process and results in poor root regrowth. New roots will not develop when the oxygen level in the soil is too low for a given species. Oxygen requirements vary considerably. Placing gravel at the bottom of a planting hole does not improve draining but rather hinders it. Gravel interferes with the normal capillary movement of water through soil. When moving trees from a site where subsoils are well drained to a clay soil with poor drainage, provide good drainage with drain tiles, plant the tree four to six inches higher than the existing grade, or do both. Avoid using any kind of fertilizers in the backfill. Overwatering is really the same as reducing the oxygen supply to the roots. Frequency of watering should be based upon the climatic conditions that have occurred since the last watering, as they are related to the water-holding capacity of the soil. Watering frequency should not be based upon time alone.