TREE SPECIES SELECTION WITH AN EYE TOWARDS MAINTENANCE[1]

by Douglas J. Chapman

The correct selection of trees can vary the annual maintenance cost from 20 to 50 percent of the planted price. Factors to consider when selecting trees for city streets or park landscapes include pruning requirements and response, disease resistance, catastrophic insect pests, soil adaption, complementary planting, shade or sun adaption, provenance, and adaptive cultivars.

Pruning requirements and response have significant impact on whether the tree will fit your program, not withstanding, budget. Some trees require annual pruning to correct habit or excess suckering, e.g. crab apple (*Malus*), silver maple (*Acer saccharinum*), boxelder (*A. negundo*), hawthorn species (*Crataegus*), red maple (*A. rubrum*), and thornless honey locust (*Gleditsia triacanthos inermis*). These trees are aggressive growers and pruning for several years (just after transplanting or on 5-year cycles) is insufficient and will result in deformed trees or problems in the future.

Compartmentalization or wound response is equally important. Silver maple, red maple, birch, elm, and beech do not have a good wound response when considering resistance to heartwood rot, generally speaking, even when considering actively growing trees, many show heartwood decay (9). When the pruning cut is in excess of 2 to 3 inches, heartwood rot, slime flux, or a similar structural problem can develop, resulting in the tree getting the name of "weak-wooded." Is it weak wood or are we, through poor pruning practices, introducing a problem? Wound response must be considered.

Trees that require little or no pruning after the initial two to three prunings during the establishment period include oak (white (*Quercus alba*), scarlet (*Q. coccinea*), pin (*Q. palustris*)), ginkgo (*Ginkgo biloba*), goldenraintree (*Koelreuteria paniculata*), sugar maple (*Acer saccharum*), Norway maple (*A. platanoides*), and black gum (*Nyssa sylvatica*), to mention only a few. These trees have relatively good habit or form.

Many trees have good disease tolerance. Crab apple, one of the most adaptive trees for park or city streets, is variably resistant to apple scab and fireblight. These diseases can be controlled by three or more pesticide applications annually or the planting of resistant cultivars. Resistant cultivars for Michigan, Wisconsin, and Northern Ohio include Malus 'Adams,' 'baccata 'Jackii,' 'Barbara Ann,' 'Beverly,' 'Bob White,' 'Callaway,' 'Candied Apple,' 'Centennial,' 'Centurian,' 'Coralburst,' 'David,' 'Dolgo,' 'Donald Wyman,' floribunda, 'Golden Hornet,' hupehensis, 'Indian Magic,' 'Indian Summer,' 'Liset,' 'Makamik,' 'Mary Potter,' 'Mount Arbor Special,' 'Professor Sprenger,' 'Profusion,' 'Red Baron,' 'Red Jewel,' 'Red Splendor,' 'Royal Ruby,' 'Ruth Ann,' sargentii, scheideckeri, 'Selkirk,' 'Sentinel,' 'Silver Moon,' 'Snowdrift,' tschonoskii, 'White Angel,' 'White Cascade,' 'Winter Gold' (2, 4, 7). Resistant cultivars are not the same for all areas of the country as there are different "strains of the disease" (fireblight and apple scab). Thus, one should contact a local nurseryman or your Cooperative Extension Service for recommended cultivars. The above cultivars give one a tremendous range to select from. Their flower color will vary from white to pink or dark red. Fruit not only varies in color but also in size from ¼ to 1 inch in diameter. These recommended cultivar's habits of growth are pendulous, oval, columnar, and dwarf. Crab apple is an exciting, small utility tree, adapted to heavy and/or well-drained soils while thriving in turf. To reiterate, the main disadvantage of *Malus* is they annually require some maintenance (insect control or pruning). This high maintenance requirement will eliminate this outstanding group of plants from some landscapes due to cost.

Maples vary greatly in disease resistance with red maple and sugar maple showing few disease problems while being less adaptive than Norway maple to urban conditions. Conversely, Norway

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maple, with all its inherent environmental tolerances, e.g. air pollutants, salt, and compacted soils, is showing increased susceptibility to Verticillium wilt, a disease somewhat analogous to Dutch elm disease.

Oak also shows variable disease resistance. White oak (*Quercus alba*) is relatively disease resistant with anthracnose, a problem during cool-moist springs only. The red oaks (*Q. coccinea, robur,* and *palustris*) show relatively good tolerance to urban conditions, transplant easily, and grow well in relatively heavy, moist soil, with the only problem being oak wilt. Oak wilt, of course, is another vascular wilt problem, somewhat analogous to Verticillium wilt and Dutch elm disease, yet it is a species specific problem of red oak types and is not a major problem in many northern areas of the country.

Insect resistance can provide another criterion of whether to or not to plant. Paper birch (*Betula papyrifera*) is one of the most highly prized native trees indigenous to the Northeast. It is planted in almost every park or home landscape but can be a maintenance headache and relatively a short-lived tree (10-15 years). Birch leaf miner and bronze birch borer attacks should greatly reduce its use. Annually, in the spring, *B. papyrifera* must be sprayed for birch leaf miner. After trees reach eight to ten years of age or older, annual spraying for bronze birch borer is a good precaution. Paper birch is best adapted to the northern, cool portions of the nation. Bronze birch borer and, to a lesser extent, birch leaf miner seem not to have catastrophic effects when the mean daily July temperature is below 70 degrees F. During a time when decreased emphasis is placed on annual insecticide applications and more on integrated pest management, should not paper birch be removed from the recommended list in the more southern areas? European white birch (*B. pendula*) has been used as a substitute for *B. papyrifera* but is more susceptible to bronze birch borer attack than our native paper birch. Several birch types which have been reported as non-host species for bronze birch borer include 'Szechuanica' birch (X *B. platyphylla* 'Szechanica'), Japanese white birch (*B. japonica*), Monarch birch (*B. maximowicziana*), grey birch (*B. populifolia*), and, lastly, river birch (*B. nigra*). Only time will tell how resistant these birch types are to bronze birch borer. Further, one must realize river birch is a much larger tree that does not have white-smooth bark at maturity. If this is understood prior to planting, it can be used where it will be an asset.

Soil conditions can make the urban forester's or arborist's job easier if it is considered prior to planting. Failure to consider soil adaption or the top 24 inches can mean half-dead trees which must be fertilized and sprayed annually to be kept alive. Shagbark hickory (*Carya ovata*), bur oak (*Quercus macrocarpa*), Scotch pine (*Pinus sylvestris*), ponderosa pine (*P. ponderosa*), limber pine (*P. flexilis*) bristlecone pine (*P. aristata*), thornless honey locust, Russian olive (*Elaeagnus angustifolia*), and goldenraintree thrive in droughty or well-drained, sandy soils. Further, many of these plants compete well with grass, deriving their moisture from a different horizon or level in the soil.

Compacted, poorly-drained, or high water table soils (water table 24 inches from the surface) are a common occurrence in many urban settings. These heavy soils provide a perfect site for many plant species. Adaptive trees for high water tables include black maple (*Acer saccharum nigrum*), red maple, silver maple, white spruce (*Picea glauca*), Norway spruce (*P. abies*), white ash (*Fraxinus americana*), green ash (*F. pennsylvanica*), scarlet oak, Hackberry (*Celtis occidentalis*), basswood (*Tilia* sp.), and katsuratree (*Cercidiphyllum japonicum*).

Companion plantings are of particular interest to park management programs. Some trees thrive when grown in turf. Bur oak is a native to the Great Plains. It has a very deep tap root, thus is not forced to compete with turf for surface moisture. Some other good companion plants for growing in turf areas include Colorado spruce (*Picea pungens*), thornless honey locust, black locust (*Robinia pseudocacia*), hedge maple (*Acer campestre*), shagbark hickory, black walnut (*Juglans nigra*), Russian olive, and crab apple. This does not mean that many other trees can't be grown in turf areas or in mass plantings, but the above species thrive. They require less artificial irrigation and fertilizer while actively competing with

a tough competitor — turf.

Eastern redbud (*Cercis canadensis*) is one example of a small tree which thrives when grown with ground covers, e.g. pachysandra, myrtle, euonymus, or ajuga. Each plant complements the other, e.g. pachysandra, by cooling the roots and being less competitive for moisture and redbud, providing shade for the pachysandra. Concurrently, maintenance is reduced by not requiring mowing and high levels of water and fertilizer. Other trees that don't thrive when planted in turf unless the branches are allowed to grow clear to the ground include sugar maple, American and European beech (*Fagus grandifolia* and *F. sylvatica*), white pine (*Pinus strobus*), and white oak (*Quercus alba*), to mention a few (6). Further, the dense shade caused by trees with the branching down to the ground results in grass being more susceptible to disease, thus continuous spraying is needed if high quality turf is desired. Why not eliminate turf? Often if a 12-inch area around the trunk is kept free of turf, many tree species seem to be more vigorous.

Sun-liable trees are ones which require sun to thrive. Pine need full sun if a specimen plant is desired. In dense plantings, self-pruning or loss of lower limbs is the result. Further, if anything shades the terminal of pine, it will soon decline and/or die. Some other trees which require full sun include crab apple, 'Bradford' callery pear (*Pyrus calleryana* 'Bradford'), and thornless honey locust, to mention a few.

Shade tolerance is a characteristic of climax forest trees. This indicates that the tree will grow in the shade of others but will thrive in full sun and eventually outcompete the original tree, e.g. maple with pine, maple becoming the dominant species. A few trees which will thrive in mass plantings or as specimens include sugar maple, red maple, white ash, American or European beech, white oak, scarlet oak, pin oak, shagbark hickory, linden (*Tilia* sp.), hawthorn (*Crataegus* sp.), and eastern redcedar (*Juniperus virginiana*). This characteristic should not only assist the park manager but also the urban forester, desiring to plant new trees, realizing that some of the older trees are in a state of rapid decline.

Some trees require shade to not only thrive but simply exist. The partial list of shade-liable trees includes striped maple (*Acer pennsylvanicum*), mountain silverbell (*Halesia monticola*), and shadblow (*Amelanchier canadensis*). These plants require little or no fertilizer, water, or pruning.

Provenance (native adaption) can be the difference between success or failure. Native trees should still provide the backbone of our urban trees. Red maple is a tree which is native from northern Michigan (the Upper Peninsula) to central Florida. The northern Michigan red maple would collapse in Florida and the same would be true for the Florida plant in Michigan. For many years 'Red Sunset,' 'Schlesinger,' 'Autumn Flame,' and 'October Glory' red maples were propagated and grown throughout the Midwest. With the advent of "Beautify America," the need for increased production caused propagation (budding and grafting) and the production of these trees to move to the Pacific Northwest. The Washington and Oregon nurserymen could produce a more uniform tree in less time. Presently, 80 to 90 percent of the shade trees are propagated in that area. For the past 10 years, with increased frequency, graft incompatibility has been a problem. Davidson at Michigan State University, suggests this "incongeniality," that is, the root stock native to one part of the country (Pacific Northwest) is not hardening off at the same time as its Midwest scion (5). The new result is early fall color, decline, and death. We should be encouraging local nurserymen and/or arboretums to select, propagate, and introduce locally-developed cultivars, e.g. "Great Lakes" cultivars of Acer rubrum, common horsechestnut (*Aesculus hippocastanum*), and black maple to mention a few. These can be propagated by cuttage, and/or tissue culture but would be adapted to regions of the country (1, 3, 8, 10). Few in Europe would try to grow a tree adapted to the United Kingdom in Norway. This does not mean that non-native trees, such as plants from the Orient or Russia will not thrive in U.S. landscapes. It does mean when we are selecting trees in other parts of the world, records should be kept to indicate what latitude the tree was growing in so that when moved to our country, provenance or adaption is considered.

The use of tree cultivars is another way to

reduce maintenance. Many of the cultivars are tolerant to insects, disease, and/or environmental stress, e.g. Washington hawthorn (*Crataegus phaenopyrum*), resistant to cedar apple rust; many crab apples, to apple scab and fireblight; 'Bloodgood' London planetree (X *Platanus acerifolia* 'Bloodgood'), to anthracnose; 'Green Mountain' black maple (*Acer saccharum nigrum* 'Green Mountain'), to salt application; and Ruby Red horsechestnut (X *Aesculus carnea* 'Briotii,' to leaf blotch. Further, these cultivars are often selected for aesthetic quality, such as red fruit — 'Winter King' hawthorn (*Crataegus viridis* 'Winter King'); desirable fall color — 'October Glory' red maple (*A. rubrum* 'October Glory'); and uniform habit — 'Greenspire' littleleaf linden (*Tilia cordata* 'Greenspire'). Aesthetics and environmental tolerance to problems are co-equally important when selecting cultivars. A good urban forestry program should still be based on native trees with new introductions to add to diversity.

As Clancy Lewis said, "I never studied a weed or bad tree." Every tree is perfect or outstanding for a particular set of conditions. After all, trees are often an indication of the quality of the community. If the urban forester can reduce annual maintenance costs by 20 to 50 percent while improving tree health, longevity, and appearance, he is fulfilling his professional responsibility. Further, one must realize that we are trying to provide minimum maintenance for trees. This minimum maintenance for some trees may mean five sprays annually to eliminate insect and disease problems while others require little or no care. One must recognize that the urban forester or arboriculturist is truly providing leadership for his community's culture of trees. Part of that leadership is species selection.

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Horticulturist,
Dow Gardens,
Midland, Michigan