

Tree Selection for Survivability: Trees That You Should Know

Kenneth D. Cochran

Matching Desired Trees To Appropriate Planting Locations

Trees can be planted and cared for to create and maintain a diverse, natural landscape system and to provide numerous functional and aesthetic benefits such as shade, shelter, and beauty. Most people consider trees among the most valuable assets of our environment, and plant selection is a key component to the survivability of plants in the landscape.

Following a November 2003 tornado through portions of Wayne County, Ohio, the effect of fallen trees was sadly apparent. It was disheartening to lose years of growth in just 10 minutes of turbulent, high-velocity winds. And added to this dismay, trees cost money — to grow, to plant, to maintain, and to remove.

The Ohio Agricultural Research and Development Center's Secrest Arboretum in Wooster, Ohio, has done a lot of tree selection evaluation work over the years in order to help research scientists, educators, students, producers, landscape designers and architects, retailers, and consumers

make wise decisions about which trees to select for a particular landscape. It is important to match desired trees to appropriate planting locations.

In most landscapes, the loss of trees calls for replacement in order to return the landscape to a diverse natural system. Landscapes that need tree replacements should be analyzed individually before a decision is made as to which tree or trees to plant. Responsible relationships should be assessed between plants, people, and the environment, following an investigation of personal needs, soil and environmental conditions, and the review of various species and cultivars for the landscape situation in question.

Considerations at Stake

Do certain trees grow in restricted and disturbed soil environments? Do certain trees withstand the assault of salt spray in winter? Do they withstand soil compaction, which reduces the macropore spaces and reduces the entry of oxygen and water into the soil mass? These are some of the questions that need to be assessed in a people / plant / environmental relationship.

Some species are native to river flood plains and can grow with reduced oxygen levels when the macropores are filled with water for long periods.

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Atmospheric temperatures affect plant growth to varying degrees depending upon species or cultivar selection.

Temperatures several degrees warmer or colder than are characteristic of a season, affect species and cultivars differently. A common stress factor of some plants is the predisposition to insect and disease attack under periods of higher temperatures.

The species red maple (*Acer rubrum*) and the European and Asian white bark birches (*Betula pendula* and *Betula platyphylla*) are examples of plants that have limited tolerance to periods of unseasonably high temperatures, while in OARDC studies, the American white bark birch (*Betula papyrifera*) has proven more heat tolerant.

Low-temperature tolerance or cold hardiness may also vary within the species *Acer rubrum* and its cultivars. The Shade Tree Evaluation Project, as it was originally named at OARDC's Secret Arboretum, illustrated the cold hardiness of a cultivar of American sweetgum, *Liquidambar styraciflua* 'Moraine,' relative to other sweetgums, during the low-temperature winter of 1976-77.

The Shade Tree Evaluation Project also illustrated the lack of cold hardiness in the hybrid sycamore, *Platanus x acerifolia*, in which cankers formed on tree trunks and severely injured trees in replicated studies at Wooster.

High winds and particularly channelized winds such as tornados are potentially seriously damaging to some species of trees. While some of these effects are apparent after the fact, it has been determined that some selections such as *Pyrus calleryana* 'Bradford' will have

more severe branch breakage even under moderate winds.

In fact, scaffold branches of 'Bradford' were severely broken under wind, snow, or ice loads over the years on all eight randomly replicated trees at the Wooster trials to the degree of destroying the tree structure. Moreover, on the OARDC'S

Wooster campus, the scaffold branch structure of 'Bradford' was destroyed on some trees to the degree that necessitated tree removal just due to the weight of foliage and fruit without the interception of high winds.

Trees develop restricted root systems and are stressed when planted within certain restricted soil zones and conditions, particularly in narrow tree lawns and in sidewalk cuts. Such soil

volume may be limiting for effective root growth, water percolation, and as a storehouse for water reserves, in which case a tree may be affected by drought stress.

Combining the Conditions of a Landscape Site With Tree Selection

Plant survival is important to most people who plant and grow trees in their landscapes. Some landscape sites are not optimal for plant life. While some plants will survive under non-natural conditions better than others, the challenge of tree selection is critical in certain landscape situations.

Obtaining information about a species' ecological adaptation greatly helps in the selection of plants for landscape situations as well as the survivability of specific





After damaging trees, houses, and businesses near downtown Wooster, the November 2003 tornado tore up trees on this hill and then crossed Route 585 (shown in the background), causing major damage to one of the city's largest businesses. Wooster is a Tree City USA, and huge old trees in various locations throughout the city were torn in two, stripped of their branches, or uprooted by the devastating winds. The tornado also struck portions of Wayne County, damaging barns and other structures.

plants. For many landscape situations, it has been proved over and over that certain species and cultivar selections thrive and sustain plant health over others. Information about plant survivability and health in the urban environment needs to be continually updated because conditions continually change and existing plants age.

Although not a necessity, the beauty of ornamental features is highly desirable from a human perspective. The eventual height and spread designation of a plant helps in choosing selections for special size requirements. Cultivars should be recommended over species when certain desired traits are identified for those cultivars.

Tree evaluations in OARDC'S Secret Arboretum have been designed so as to conduct an unbiased scientific evaluation of trees in replicated and randomized plots. Several trees mentioned in this article can be found in the Deciduous Tree Evaluation Project in the Arboretum, USDA Cold Hardiness Zone 5b.

The intention of this writing is not to mention all trees suitable for landscape planting, but to bring to attention of consumers and producers a diverse sampling of proven selections for various Ohio growing conditions and to help people make plant selection decisions that will maximize value in people / plant / environmental relationships.

Tapping into Deciduous Tree Selections That Consistently Rank as Good Landscape Investments

Acer rubrum (red maple) is a species noted for its ability to withstand moist, poorly drained sites, but not soils that readily dry during the heat and drought of summer. Maples are a popular tree, and there has been interest in selecting superior types of red maple for good red autumn foliage, such as 'Red Sunset' and 'Autumn Flame.' The cultivar 'Columnare' has withstood heat and drought very well in Wooster studies.

A Dutch nurseryman visiting the Secret evaluations requested propagation material of this selection because in his estimation, 'Columnare' was the best cultivar in the evaluation. The hybrid maple, cross of red and silver maple, *Acer x freemanii* 'Jeffersred,' Autumn Blaze® flourishes under hot and cold climates, and in the Secret Arboretum it has been consistently attractive in autumn (see *Green Times*, Vol. VI, No. 2/3, "Riotous color: Maples and autumn foliage").

Betula nigra (river birch) adapts to poorly drained soil conditions and is native to river-bottom areas. Leaf miners can cause cosmetic foliage damage, but bronze birch borers or diseases do not limit the use of this species. An 11-year-old plant of the spreading selection Fox Valley® is 6 feet in height and spread in Secret Arboretum

and is an eye-catcher. Its habit is uniform, compact, and densely branched from the ground; it is adaptable to poorly aerated soil conditions, and the ornamental feature of colorful patterns of cinnamon-red and pale-salmon exfoliating bark on main branches becomes evident at an early age. Surely there is an appropriate small-scale site in the landscape for Fox Valley®.

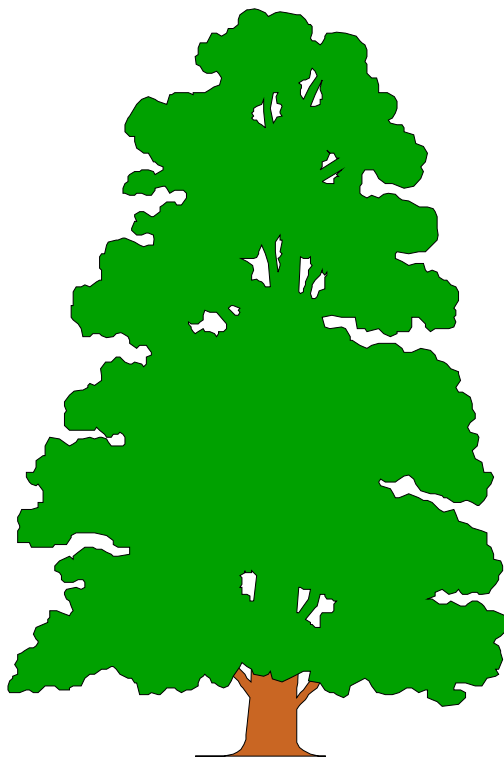
Three excellent disease- and insect-resistant species with tolerance to the dry soil conditions of the urban landscape are *Carpinus caroliniana* (American hornbeam,

ironwood); *Ginkgo biloba* (maidenhairtree), with male selections such as 'Autumn Gold' and 'Lakeview'; and *Gymnocladus dioica* (Kentucky coffeetree), another North American native.

Total aesthetic ratings of crabapples have been continuously evaluated at Secret Arboretum from 1993 to the present. Consider crabapple selections by referring to *Ornamental Plants, Annual Reports and Research Reviews, 2002, Special Circular 189, The Ohio State*

University, Ohio Agricultural Research and Development Center.

Among *Quercus* (oaks), there are several excellent species that are long-lived and have performed well in urban environments. *Quercus macrocarpa* (bur oak) is a wide spreading tree more tolerant of drought than some oak species. *Quercus shumardii* (Shumard oak) has a good growth rate in average soil conditions, even soils with high pH. *Quercus*



muehlenbergii (chinkapin oak) is found in its native Ohio habitat on dry alkaline soils and in fertile bottomland (see *Green Times*, Vol. V, No. 2/3, "How Mighty Is the Oak").

The species *Celtis occidentalis* (common hackberry), while not extensively evaluated at Wooster, is adaptable to many environments, even tolerant of harsh climates. The cultivars 'Prairie Pride,' 'Chicagoland,' and 'Windy City' are resistant to the witches' broom disease that tends to occur on the species. The species is adaptable in its tolerance to soil-moisture stresses, with adaptability to poorly drained soils as well as a tolerance of dry soils.

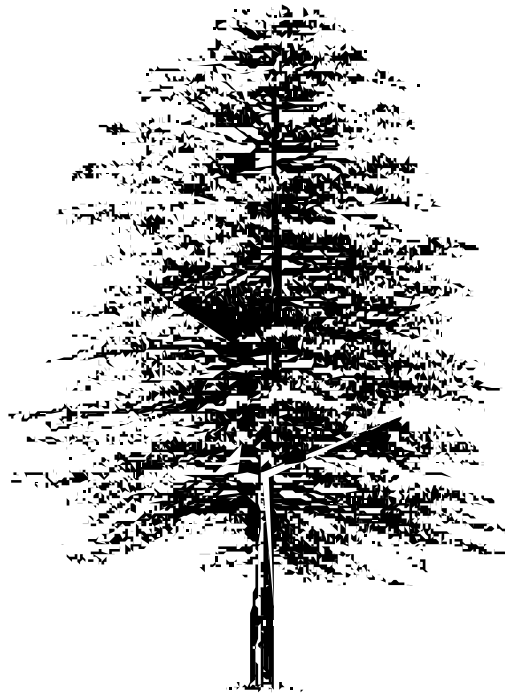
Consider trees that mature to 20 to 30 feet in height for small spaces or in some cases as understory plantings. A small tree with cinnamon-brown peeling, showy bark and reddish-bronze autumn foliage is *Acer griseum* (paperbark maple).

Consider the genus that signals spring and has year-round interest when grown in full sun or partial shade — *Amelanchier* (serviceberry) and cultivars of *Amelanchier arborea*, *A. canadensis*, *A. laevis*, and *A. x grandiflora* with 'Autumn Brilliance' being true to its name.

Cornus alternifolia (pagoda dogwood) is a small, tiered, horizontally branched tree for a strong planar positioning. It is at home when planted in a cool, understory

environment, where it develops its full potential when protected from excessive sun.

A grand and noble tree is *Tilia tomentosa* (silver linden), native to southeastern Europe and western Asia, but adaptable to Ohio in terms of varied temperature and moisture tolerance. It is potentially a large tree with heat and drought tolerance, and the sweetly fragrant flowers enhance the air in early summer. The Ohio native species *Tilia americana* (American linden) is a good Midwestern lawn tree and the cultivar 'Redmond' has grown well in Wooster trials.



The monoculture of *Ulmus americana* (American elm) in the early decades of the 20th century taught the importance of

species diversity in planting trees in our cities and towns. Elm tree hybridization by the USDA Nursery Crops Research Laboratory, Delaware, Ohio, followed the death of millions of American elms from Dutch elm disease.

Three of these hybrid cultivars have been evaluated in Secret Arboretum. 'Urban,' 'Homestead,' and 'Pioneer' have proved to be tolerant of the stresses of varied soil conditions, poorly drained or dry and compact soils, and have had rapid growth. No Dutch elm disease has occurred in more than 30 years of evaluations at Secret, but cosmetic insect problems have occurred.

In Conclusion

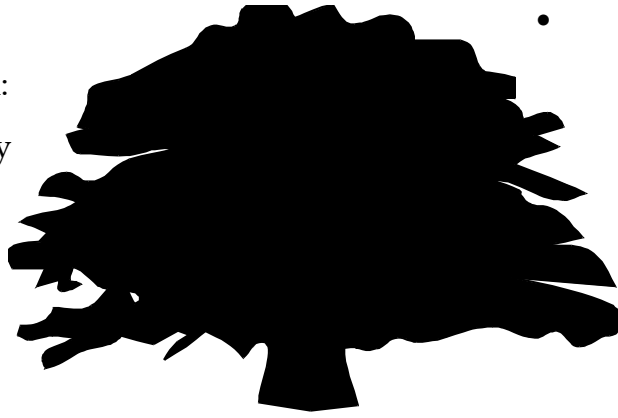
For more information:

- Read *Ohio Trees*, by T. Davis Sydnor and William E. Cowen on the web at:

<http://ohioline.osu.edu/b700/index.htm>

Ohio Trees is also available through local Ohio State University Extension offices.

- Attend Tour de Trees at Secrest Arboretum on Tuesday, March 23, 2004, from 1 p.m. to 3 p.m.
- Subscribe to *Green Times*, a publication of Secrest Arboretum.
- Join the Friends of Secrest Arboretum.



- Visit our web site at:
www.secrest.osu.edu

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