



*Urban Trees:  
Site Assessment  
Selection for Stress Tolerance  
Planting*

*Urban Horticulture Institute  
Cornell University  
Ithaca, New York*

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Selection for Stress Tolerance  
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**URBAN HORTICULTURE INSTITUTE  
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## Table of Contents

	page
Acknowledgments .....	iv
Introduction and Site Assessment .....	1
Site Assessment Checklist .....	3
Completing the Site Assessment Checklist .....	5
USDA Hardiness Zone Map .....	10
Urban Trees For USDA Zone 6 and Below	
I. Small Trees, <30', Suitable for Planting Under Overhead Utility Wires or in Restricted Spaces .....	11
Table of Ornamental Characteristics of Disease Resistant Crabapples .....	26
II. Medium to Large Trees, >30', That Do Well in City Environments .....	27
Trees Grouped For Various Site Conditions .....	53
Transplanting Guide .....	58

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# INTRODUCTION

This list is designed to help you choose the most appropriate tree for any given urban situation. There is no one perfect tree! The most successful course is to match the planting site limitations with the right tree for that spot. Diversity is one of the keys to a successful tree planting program. By seeking to plant the 'perfect urban tree' over and over again we set ourselves up for a disaster in the future. Over-planting one type of tree results in a monoculture that often encourages the build-up of insect populations or diseases that can destroy an entire planting. For example, the American elm, an enormously successful street tree, quickly died out with the introduction of Dutch Elm Disease. The rapid death of these trees was exacerbated by uniform, non-diversified urban plantings.

I believe a reasonable goal for most urban plantings is to place a 5% limit on any one species within the total municipal tree population. Therefore, if a disease or an insect infestation should occur, 95% of a tree population would remain intact. Unfortunately, in most urban areas perhaps only five or fewer species make up the great majority of trees planted.

If there is no one perfect urban tree, it is also important to understand that there is no one urban environment. The urban environment is a varied conglomeration of microclimates. Above ground or below ground site conditions can change dramatically within the space of a few feet.

This list of recommended urban trees will only accomplish half the task of choosing an appropriate tree. A reasonable site assessment should be completed prior to selection.

## ASSESS YOUR SITE

### BELOW GROUND

**RESTRICTED ROOTING SPACE.** Underground obstacles, compaction near curbs and driveways, and actual containerization of trees causes restricted rooting space that limits the amount of water, nutrients and O<sub>2</sub> to which roots have access. Drought tolerant trees offer some hope; however, adequate rooting space should be planned for before planting.

**SOIL TEXTURE.** A sandy soil will suffer less from the effects of compaction but may be less able to supply water to trees. Conversely, compaction may render a heavy clay soil too wet making oxygen unavailable.

**SOIL pH.** Most urban soils have a high pH (from near neutral to alkaline) due to limestone containing materials in the street environment. A simple pH test can determine your site's characteristics.

**DRAINAGE.** Poor drainage due to compaction or underground obstacles can easily be estimated. Place an open ended coffee can in a hole where you want to plant, pour water in and observe how long it takes for the water to drain. If water hasn't drained at least one inch in an hour, you may want to install supplemental drains or choose species that can tolerate intermittent flooding.

**ROAD SALT.** In areas where high levels of road salt or sidewalk salts are used, planting tolerant species can minimize damage later.

## **ABOVE GROUND**

**EXPOSURE.** Excessively windy sites will often place stress on trees with large leaves that may result in leaf tatter. Also, trees in these sites may need supplemental watering to prevent them from drying out as quickly.

Shady sites determined by the sun and shade patterns around buildings may limit the choice of trees. Most trees require full sun, but a few may tolerate slightly lower levels.

**BUILDING SET-BACK/OVERHEAD WIRES.** The presence of physical barriers to tree growth above ground such as a narrow building set back from the street and/or overhead high tension wires require a tree that will not interfere with these structures. Columnar forms of trees or those with low mature heights (less than 30') can be used in these situations.

**SURROUNDING BUILDING SURFACES.** Concrete, asphalt, car roofs, mirrored building surfaces, etc., increase the reflected and reradiated heat load on a tree. This can cause a tree to heat up and lose water from its leaves at a faster than normal rate. Drought resistant trees should be chosen in these situations.

**USDA TEMPERATURE ZONES (see map on page 10).** All trees chosen for your planting area should be cold hardy. Urban environments often have larger temperature fluctuations due to reflected/reradiated heat from buildings and due to sheltering from winds. A good rule is to plant trees that conform to your zone or lower (colder) temperatures. Trees in containers are more susceptible to cold winter temperatures than trees in the ground.

After assessing your site and choosing your tree, be careful to pay attention to good planting techniques including planting during the proper time of year.

**HOW RELIABLE IS THIS INFORMATION?** The information in this list has been gleaned from many sources. Among them are *Street Trees for Metropolitan New York* by Paul Berrang and David Karnosky, *Landscape Plants for Eastern North America* by Harrison Flint, *Manual of Woody Landscape Plants* by Michael Dirr and *The Proceedings of the Metropolitan Tree Improvement Alliance (METRIA)*. Numerous nursery owners, city foresters and arborists as well as nursery catalogues were also consulted. Furthermore, our observations and research at the Urban Horticulture Institute at Cornell University figured prominently in the final project. Given the wide breadth of sources, I feel this is reliable information that nevertheless is subject to regional variations and interpretation. Observe trees in your area before planting to see if there are any species that are doing particularly well or poorly. Also important to note is that the tolerances of the trees described by the list refer to trees that have become established in the landscape. All trees when newly transplanted are much more prone to damage from environmental stresses. There is no substitute for adequate tree maintenance.

Nina L. Bassuk  
Program Leader  
Urban Horticulture Institute

## Site Assessment Checklist

Site Location \_\_\_\_\_

Site Description \_\_\_\_\_

### Climate

#### *USDA Hardiness Zone*

- |                             |                             |                             |
|-----------------------------|-----------------------------|-----------------------------|
| <input type="checkbox"/> 7a | <input type="checkbox"/> 5b | <input type="checkbox"/> 4a |
| <input type="checkbox"/> 6b | <input type="checkbox"/> 5a | <input type="checkbox"/> 3b |
| <input type="checkbox"/> 6a | <input type="checkbox"/> 4b | <input type="checkbox"/> 3a |

#### *Microclimate Factors*

- Re-reflected heat load
- Frost pocket
- Wind
- Other \_\_\_\_\_

#### *Sunlight Levels*

- Full sun (6 hrs. or more)
- Partial sun or filtered light
- Shade

#### *Irrigation Levels*

- No supplemental irrigation
  - Automatic irrigation system
- Irrigation amount and rate: \_\_\_\_\_

### Soil Factors

*Range of pH Levels* \_\_\_\_\_

(Note actual readings on sketch)

*Texture* \_\_\_\_\_

- Clayey
- Loamy
- Sandy

#### *Compaction Levels*

- Severely compacted
- Moderately compacted
- Somewhat compacted
- Uncompacted

### Structural Factors

#### *Limitations to above-ground space*

- Overhead wire height \_\_\_\_\_
- Proximity to buildings/structures
- Other \_\_\_\_\_

#### *Limitations to below-ground space*

- Utilities marked and noted on sketch
- Approximate rooting depth for site: \_\_\_\_\_

### Drainage Characteristics

- Presence of mottled soil
  - Low-lying topography
- Indicator plants suggest site drainage:  
 wet    well-drained    dry
- Percolation test results (in./hr.)
- poorly drained (< 1"/hr.)
  - moderately drained (1" - 6"/hr.)
  - excessively drained (> 6"/hr.)

#### *Other Soil Considerations*

- Indications of soil layer disturbance
- Evidence of recent construction
- Presence of construction debris
- Noxious weeds present \_\_\_\_\_

- Evidence of excessive salt usage

- Erosion of soil evident

- Evidence of soil contamination

- Usage that compacts soil

#### *Specific Soil Problems*

## Visual Assessment of Existing Plants

Species                      Size                      Growth Rate                      Visual Assessment

---

### Sketch of Site

Note north arrow; circulation patterns; pH readings; location of overhead wires, underground utilities, buildings and pavement, as well as problem drainage areas.

## Completing the Site Assessment Checklist

### *Suggested Tools and Materials*

Cornell pH test kit and instructions	shovel and trowel
soil texture by feel instructions	plastic bags
wash bottle filled with water	wristwatch or timer
at least 4 gallon jugs of water	weed identification manual
paper towels	ornamental plant identification manual
measuring tape	hand pruners
yardstick	pencil/pen and extra paper

**Optional tools** diameter tape, penetrometer, soil probe, vials containing alcohol for unknown insects, infrared thermometer

*Site Location* Note the address of the site. You may also wish to note the nearest cross streets and/or page and grid of the maps your firm uses.

*Site Description* A brief overview of the site including general use or function, approximate size, accessibility, general topography (steep hill, gentle slope, etc.)

### *Climate*

*USDA Hardiness Zone* Check the USDA hardiness zone of the site

#### *Microclimate Factors*

Re-reflected heat load -- Determine if the site, or some portion of it, has heat pockets due to reflected heat from pavement, automobiles, buildings or other surfaces. These pockets are often south-facing and have a tremendous amount of heat load. On sunny days, these areas will be noticeably warmer than nearby spots.

Frost pocket -- Frost pockets are often found in low areas at the bottom of a slope or bowl. Cooler air, being heavier, collects in these areas lowering air temperatures.

Wind -- Signs of excessive wind are trees leaning or growing in the same direction. Plants will have stunted growth on the side that faces the full force of the prevailing wind. Wind tunnels are common in urban areas where wind is funneled between tall buildings.

Other -- Are there other factors that might affect the climate or precipitation levels? For example, are there wide rain shadows formed by the overhang of a building? Is the site located near a large body of water that may moderate the climate?

*Sunlight Levels* Consider that a site has full sun if it receives more than 6 hours of direct sunlight. Partial sun has direct sun (often morning sun) for less than 6 hours, or filtered light (as would be common under a tree with fine-textured leaves) for most of the day. An area is consider shady if it receives little or no direct sunlight, or if it receives less than 6 hours of filtered light.

*Irrigation Levels* Note the presence or absence of an automatic irrigation system. If possible record the method of delivery (overhead, drip, mini-sprinkler), the weekly amount of water applied and the rate at which it is applied. You may wish to test the system by setting out collection containers in different areas on the site and running the system for a specified amount of time to test the delivery rate. Comparing the actual amount delivered with the manufacturer's specifications for the system will indicate its efficiency.

### **Soil Factors**

*Range of pH Levels* Check the pH for several areas on the site. Pay particular attention to the pH near sidewalks and parking areas, concrete or masonry buildings or foundations. Note the range of levels on the front side of the checklist. Note the sample locations and exact readings on the sketch on the back of the checklist.

*Texture* In the field, test the soil texture using the soil texture-by-feel technique, and record the results on the checklist. If you must know the exact soil texture, record the general soil type on the checklist and collect several samples to be analyzed by a soils lab.

*Compaction Levels* There are several ways to test for soil compaction. A simple one is to use a penetrometer. Record the average depth of penetration at which the probe measures 200 psi. Alternately, you may take several soil cores using a soil probe and analyze them for soil density. Perhaps the simplest test is to dig a small pit and gauge the difficulty of hand digging. Repeat the 'shovel test' in several spots.

*Drainage Characteristics* Determining the drainage characteristics of your site is a multi-faceted task.

Presence of mottled soil -- The strongest indication of poor drainage is mottled soil. Dig a soil pit at least 12" to 15" deep and remove several clods for examination. Clods that have grey mottling and/or have a foul odor indicate poor drainage.

Low-lying topography -- Study the topography for low-lying areas that collect surface runoff and that may be poorly drained.

Indicator plants -- Plants that indicate poorly drained (wet) sites include willow, swamp white oak, and tupelo. Plants that indicate moist soils are sycamore and tulip trees. Plants that indicate well-drained sites are sugar maple, red oaks and hickories.

Percolation test -- To perform a percolation test, dig a pit approximately one foot deep. Fill the pit with water and allow this water to drain completely. Once the water has completely drained, refill the pit with water, measure the depth of water in the pit and note the time. After 15 minutes, note the depth of water and calculate the rate of drainage in inches per hour. (The initial filling and draining of the pit is to saturate the soil to test more closely for gravitational water movement.) Classify the soil into one of the three drainage classes.

### *Other Soil Considerations*

Indications of soil layer disturbance -- Look for areas that show evidence of regrading cuts or fills. Clues include mature trees that do not show a trunk flare (due to soil piled against the trunks), or have retaining walls near their bases. You may wish to dig a pit approximately two feet deep in order to examine the soil horizons, especially if the site has recently had construction activity. Soil layers that are noticeably lighter in color than lower layers indicate that subsoil has been spread on top of the original grade. Conversely, the absence of a rich brown, organic layer at the top may indicate that the topsoil has been removed.

Evidence of recent construction -- Clues include newly-pave surfaces, turf that is noticeably thinner than in surrounding areas, new retaining walls, soil 'humps' or subsidence, and the like. Also consider the route or routes taken by heavy equipment into the site and where materials were stored during construction.

Presence of construction debris likely -- Construction debris is likely on almost all construction sites, particularly if tipping fees for debris are high in your area, and if construction involved the renovation or removal of a building or pavement.

Noxious weeds present -- Use a guide to identify weeds. Pay particular attention to perennial noxious weeds that must be eradicated before landscape installation. Perennial weeds that are commonly found in urban landscapes include: bindweed, poison ivy, mugwort, wild violet, nutsedge, quackgrass, and heal-all.

Evidence of excessive salt usage/salt injury -- Look (particularly near walks and parking areas) for white powder that has precipitated out on the soil surface. Prostrate knotweed is a weed that indicates salty compacted soil. Brown needle tips, marginal leaf scorch, or witches' broom on ornamentals indicate salt injury. Carefully examine areas where salt-laden snow has been dumped. These areas are likely to have high soil salt concentrations.

Erosion of soil evident -- Determine the extent and severity of soil erosion. Note the presence and size of eroded gullies, rills, or soil slumps. Factors that affect soil erosion include: rainfall intensity, quantity, and runoff; slope length and gradient; amount of stabilizing plant material or other erosion control practices; the infiltration rate and the structural stability of the soil.

Evidence of soil contamination -- Look for signs of dumping by restaurants or open-air food stalls of wash water, old dumping areas, construction dumping areas, oil and gas dumping, and the like.

Usage that compacts soil -- Is the area used for open-air markets or parties? Are there pathways that pedestrians have created? Is the area sometimes used for parking? Are there other social activities that are planned for the site that tend to compact the soil?

***Specific Soil Problems*** Use this space to record specific soil problems that occur on the site. Problems might include an inability to surface drain a site, possible soil chemical contaminants, and the like.

## ***Structural Factors***

### *Limitations to above-ground space*

Overhead wire height -- Describe the location and estimate the height of overhead utility wires.

Proximity to buildings and structures -- Note the location of buildings and structures on the back of the checklist. Check the box on the front side of the checklist if you anticipate buildings or structures having an impact on the canopy space of landscape plantings.

Other -- Are there any other limitations to above-ground space? Examples include: building or planting setbacks, emergency access lanes that must be kept clear, heat vents, and signs that must be readable from the road.

### *Limitations to below-ground space*

Utilities -- Mark utilities on the sketch. Identify individual utilities if possible. Know that you must hand dig within two feet on either side of the marked line.

Estimate rooting depth and volume -- In order to estimate the available rooting volume of a planting site, measure the length and width of available soil, and multiply area by the estimated depth of rooting. Remember that compacted soil will have a very shallow rooting depth.

## ***Visual Assessment of Existing Plants***

*Species* Identify the species of plant -- The more specific identification is, the better. You may wish to collect leaf and/or bud samples to bring back to the office for identification of obscure plants or plants not in leaf.

*Size* Approximate the height and spread of the plant material using the following field method: Place a yard stick (or other object of known height) against the trunk. Step back so that the whole tree is in your sight. While holding a pencil or pen at arm's length, line up the top of the ruler with the tip of the pencil. Using your thumbnail, mark the base of the ruler on the pencil. Sighting up the tree, determine how many 'rulers' fit into the tree. Multiply this number by the length of the ruler for a height approximation. Use the same method to estimate the canopy spread. You may also wish to note the diameter of the trunk at breast height (4.5' above ground level).

*Growth rate* Quantify this year's annual shoot extension by measuring the twig length between growth tip (terminal bud) and the bud scale scar. Past years' growth is the length between bud scales. Measure several branches on each tree you sample and record the average growth rate. Less than 2" of growth is considered poor, 2" to 6" is moderate growth, and greater than 6" per year is vigorous growth.

### *Visual Assessment*

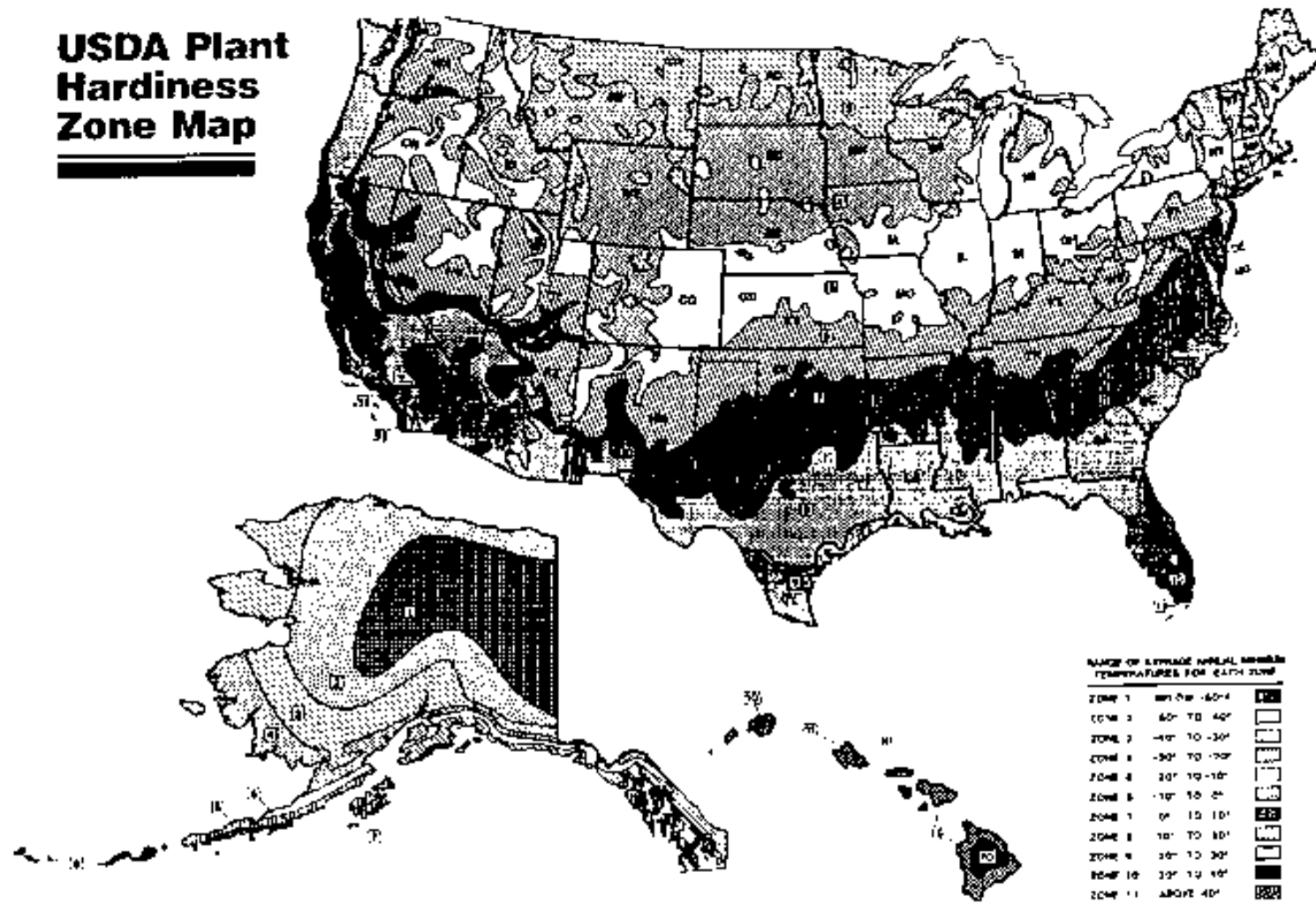
In general -- Note aesthetic quality and general health of each plant. Indicate mechanical injury to plant parts. Also note the presence of insects or disease. Keep in mind that diseases and insects often attack stressed trees and may not be the primary cause of health problems.

Trunk assessment -- Look for evidence of mower or string trimmer damage at the base of the trunk. Also look for excessive suckering or bark splitting. Note any trees that do not exhibit a trunk flare (indicative of recent regrading activity or that it was planted too deep).

Roots -- Note excessive surface rooting and girdling roots. These may signify poor drainage, too-deep planting, and/or compacted soils. Test the stability of newly planted trees by gently rocking them. If there is excessive movement, the trees may have root problems, or the roots were never able to establish after transplanting.

Leaves and branches -- Stressed trees often exhibit small, off-color leaves that drop early in the fall. Also note trees whose leaves show marginal leaf scorch and whose branches have tip dieback. If there is significant dieback, is it all on one side of the canopy or is it on both sides? Do all of one species on the site exhibit the same symptoms? Note the presence of witches' broom, watersprouts, or other abnormalities.

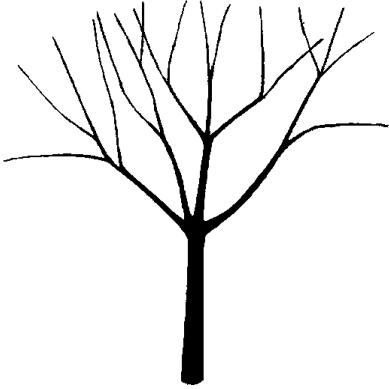
# USDA Plant Hardiness Zone Map



# RECOMMENDED URBAN TREES FOR USDA ZONE 6 AND BELOW

## I. SMALL TREES, SUITABLE FOR PLANTING UNDER LOW OVERHEAD UTILITY WIRES OR RESTRICTED SPACES

---



**Scientific name:** *Acer buergerianum*

**Common name:** Trident Maple

**Environmental characteristics:**

**Zone:** 5b or 6a - 8a

**Wet/dry:** tolerates moderate drought

**Salt:** moderate tolerance

**pH:** 5.0 - 7.0

**Other:**

**Insect/Disease factors:** none serious

**Ornamental characteristics:**

**Height:** 20' - 25'

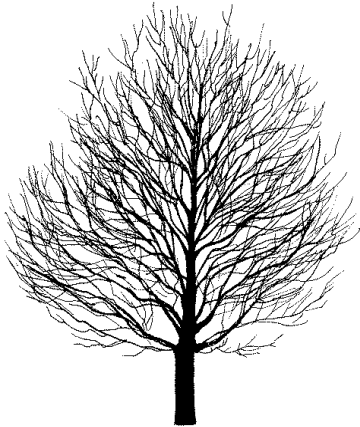
**Shape:** round

**Other:** variable fall color, low branched, will require pruning to be used as a street tree

**Cultivars:**

**Additional:** transplant in spring or fall

---



**Scientific name:** *Acer campestre*

**Common name:** Hedge Maple

**Environmental characteristics:**

**Zone:** 5a - 8b

**Wet/dry:** tolerates drought

**Salt:** moderate tolerance

**pH:** 5.0 - 8.2

**Other:** adapted to compaction, severe pruning

**Insect/Disease factors:** relatively pest free

**Ornamental characteristics:**

**Height:** 25' - 35'

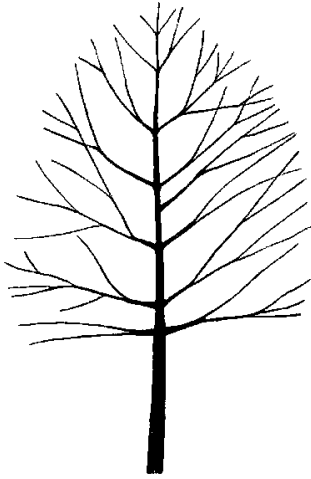
**Shape:** round

**Other:**

**Cultivars:** 'Queen Elizabeth' (more upright, vigorous [zone 6b - 7b]), 'Schichtel's Upright' (5b - 8b)

**Additional:** easily transplanted in spring or fall

---



*A. truncatum* 'Norwegian Sunset'

**Scientific name:** *Acer truncatum*

**Common name:** Shantung Maple

**Environmental characteristics:**

**Zone:** 5a - 7b (species is variable, hybrid cultivars zone 5)

**Wet/dry:** requires moist, well drained site, tolerates moderate drought

**Salt:** moderate tolerance

**pH:** 5.0 - 8.2

**Other:** resistant to leaf scorch

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 25' - 30'

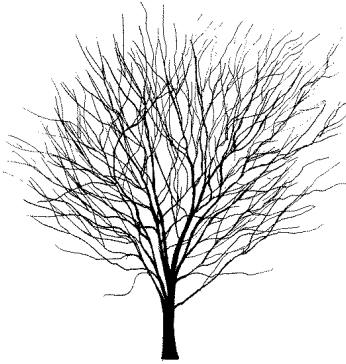
**Shape:** round

**Other:** when emerging leaf color purplish-red changing to green, fall color yellow/orange/red

**Cultivars:** hybrids with *A. platanoides* are 'Norwegian Sunset' (upright round, orange-red to red fall color, more heat & drought tolerant than *A. platanoides*) and 'Pacific Sunset' (upright oval, finer branched and red fall color earlier than 'Norwegian Sunset')

**Additional:** transplant in spring or fall

---



A.. 'Cumulus'

**Scientific name:** *Amelanchier spp.*

**Common name:** Serviceberry

**Environmental characteristics:**

**Zone:** 3b - 8a

**Wet/dry:** requires moist, well drained site

**Salt:** moderate tolerance

**pH:** 5.0 - 7.5

**Other:** prefers acid soil but adaptable to moderately alkaline soil

**Insect/Disease factors:** fireblight, mites and scale can be problematic if site requirements not met, 'Autumn Brilliance' resistant to leaf spot

**Ornamental characteristics:**

**Height:** 20' - 30'

**Shape:** oval

**Other:** early white flowers, edible fruit, good red to yellow fall color, clump or single stem

**Cultivars:** 'Autumn Sunset' (strong single trunk, pumpkin-orange fall color, excellent heat and drought tolerance), 'Cumulus' (upright, yellow to orange-scarlet fall color), 'Robin Hill' (pink buds, white flowers, earliest to bloom, narrowest shape, yellow to red fall color), 'Tradition' (strong central leader, heavy fruiting, orange and red fall color)

**Additional:** transplant in spring

---



*Carpinus caroliniana* clump

**Scientific name:** *Carpinus caroliniana*

**Common name:** American Hornbeam, Musclewood, Ironwood

**Environmental characteristics:**

**Zone:** 3b - 9a

**Wet/dry:** prefers moist soil but will tolerate some intermittent drought

**Salt:**

**pH:** 5.0 - 8.2

**Other:** prefers shaded, moist soils

**Insect/Disease factors:** relatively trouble free, little maintenance, ice storms can be a problem.

**Ornamental characteristics:**

**Height:** 30'

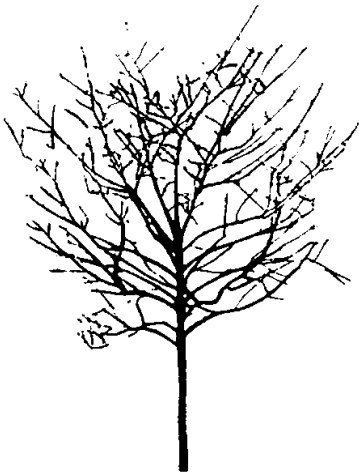
**Shape:** round, spreading

**Other:** "muscle" bark, good orange-red fall color, clumps or single stem

**Cultivars:**

**Additional:** transplant in spring, somewhat slower to establish

---



**Scientific name:** *Crataegus crus-galli inermis*

**Common name:** Thornless Cockspur Hawthorn

**Environmental characteristics:**

**Zone:** 4a - 6b

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** tolerant of a wide range of soils except poorly drained ones

**Insect/Disease factors:** resistant to cedar-hawthorn rust, leaf blight, lacebug

**Ornamental characteristics:**

**Height:** 20' - 25'

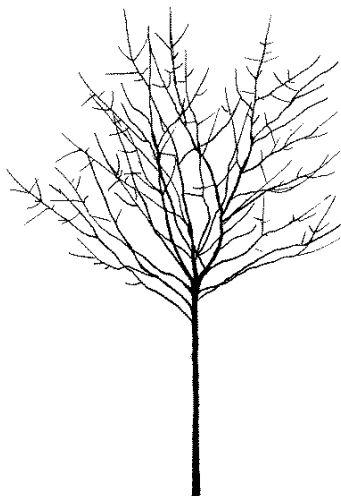
**Shape:** round

**Other:** white flowers, bright red persistent fruit, strongly horizontal branching pattern

**Cultivars:** 'Crusader' said to be very disease resistant

**Additional:** transplant B & B, somewhat slow to establish

---



**Scientific name:** *Crataegus phaenopyrum*

**Common name:** Washington Hawthorn

**Environmental characteristics:**

**Zone:** 4b - 8b

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** tolerant of a wide range of soils except poorly drained ones

**Insect/Disease factors:** resistant to cedar-hawthorn rust, less susceptible than other hawthorn to disease, susceptible to lacebug

**Ornamental characteristics:**

**Height:** 20' - 30'

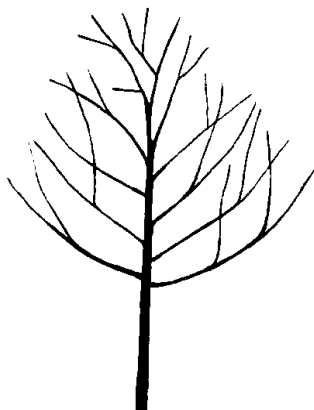
**Shape:** round

**Other:** white flowers, thorny, reddish-purple fall color, bright, glossy red persistent fruit

**Cultivars:**

**Additional:** transplant in spring, somewhat slow to establish

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**Scientific name:** *Crataegus punctata inermis* 'Ohio Pioneer'

**Common name:** Ohio Pioneer Hawthorn

**Environmental characteristics:**

**Zone:** 4a - 6b

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 20' - 30'

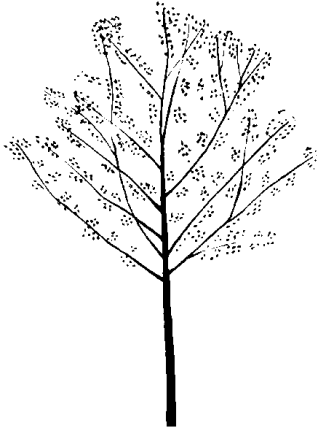
**Shape:** round

**Other:** white spring flowers, purplish red fall color, thornless, horizontal branching pattern, dark red persistent fruit

**Cultivars:** 'Ohio Pioneer'

**Additional:** transplant in spring, somewhat slow to establish

---



**Scientific name:** *Crataegus viridis* 'Winter King'

**Common name:** Winter King Hawthorn

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** resistant to cedar-hawthorn rust, less susceptible than other hawthorns to disease

**Ornamental characteristics:**

**Height:** 20' - 30'

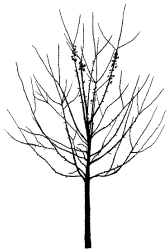
**Shape:** oval

**Other:** thorny, white flowers, purple and scarlet fall color, bright red persistent fruit, outstanding for size and retention in winter

**Cultivars:** only cultivar available

**Additional:** transplant in spring, somewhat slow to establish

---



**Scientific name:** *Malus spp.*

**Common name:** Flowering Crabapple

**Environmental characteristics:**

**Zone:** 3 or 4 up to 8b

**Wet/dry:** tolerates drought

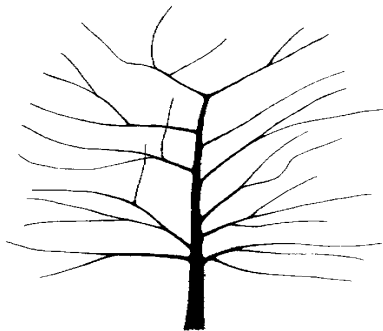
**Salt:** moderate salt tolerance

**pH:** 5.0 - 8.2

**Other:** easy to transplant

**Insect/Disease:** see below for information on specific disease resistant cultivars

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**Cultivar:** *Malus* 'Adams'

**Zone:** 4a - 7a

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** deep pink, profuse

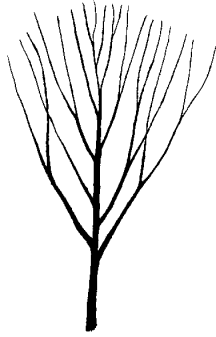
**Fruit:** red, persistent, 5/8"

**Leaves:** green with red tint

**Other:** buds deep pink

**Insect/Disease:** excellent resistant to cedar-apple rust and fireblight, good resistance to scab and mildew, moderately resistant to gypsy moth, cankerworm, eastern tent caterpillar

---



**Cultivar:** *Malus* 'Adirondack'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 18'

**Shape:** vase

**Flowers:** white, heavily textured

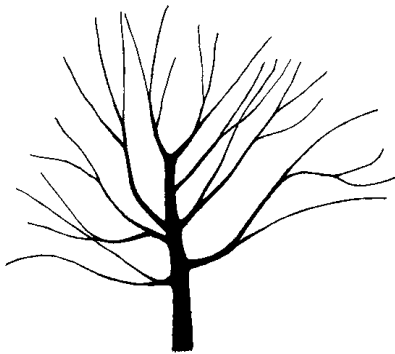
**Fruit:** bright red, 1/2"

**Leaves:** dark green, leathery

**Other:** buds dark carmine

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight, scab and mildew

---



**Cultivar:** *Malus baccata* 'Jackii'

**Zone:** 3a - 7a

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** white, fragrant, early

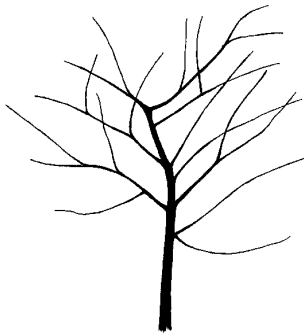
**Fruit:** deep red-purple, long stemmed, 3/8"

**Leaves:** glossy green

**Other:** buds white tinged pink, blooms as young tree

**Insect/Disease:** excellent resistance to cedar-apple rust, scab and mildew, fair resistance to fireblight

---



**Cultivar:** *Malus* 'Baskatong'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 25'

**Shape:** oval

**Flowers:** red-purple

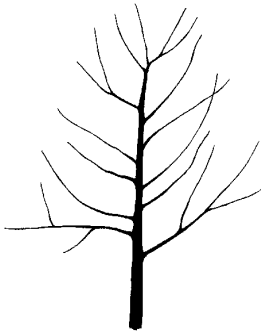
**Fruit:** dark red, 1"

**Leaves:** purple changing to bronze

**Other:** buds dark purple

**Insect/Disease:** disease resistant except for minor susceptibility to scab, good resistance to Japanese beetles

---



**Cultivar:** *Malus* 'Centurion'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** narrow oval

**Flowers:** rose red

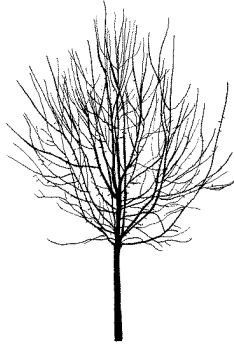
**Fruit:** bright red, persistent, 5/8"

**Leaves:** reddish changing to green

**Other:** buds dark red

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight and mildew, good resistance to scab

---



**Cultivar:** *Malus* 'Dolgo'

**Zone:** 3b - 7a

**Ornamental characteristics:**

**Height:** 30'

**Shape:** oval, spreading with age

**Flowers:** white

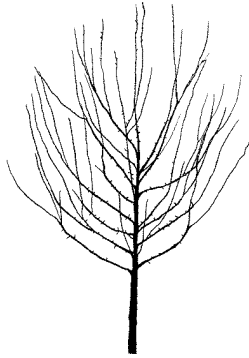
**Fruit:** bright red, edible, 1 1/2"

**Leaves:** glossy green

**Other:** white

**Insect/Disease:** excellent resistance to cedar-apple rust and mildew, good resistance to scab and fireblight, resistant to frog eye leaf spot

---



**Cultivar:** *Malus* 'Donald Wyman'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** white, abundant

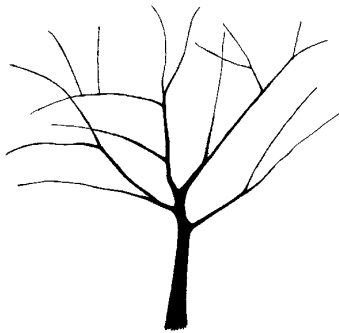
**Fruit:** glossy bright red, abundant, persistent, 3/8"

**Leaves:** dark green

**Other:** buds pink

**Insect/Disease:** excellent resistance to cedar-apple rust and mildew, good resistance to scab, fireblight and frog eye leaf spot

---



**Cultivar:** *Malus* 'Dobloons'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** dense oval, spreading with age

**Flowers:** white, double

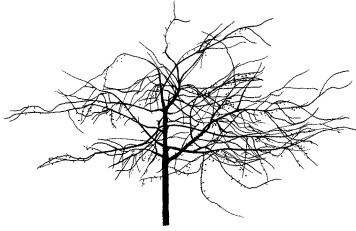
**Fruit:** bright lemon-yellow, abundant, persistent, 3/8"

**Leaves:** deep green

**Other:** buds rich carmine, leaves have lemon-gold fall color

**Insect/Disease:** excellent resistance to cedar-apple rust and mildew, good resistance to scab and fireblight

---



**Cultivar:** *Malus floribunda*

**Zone:** 4b - 8b

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** pink fading to white, profuse, 1 - 1 1/2"

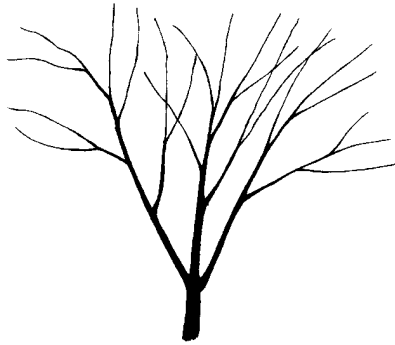
**Fruit:** yellow/red, 3/8"

**Leaves:** dense, small, green

**Other:** buds carmine

**Insect/Disease:** excellent resistance to cedar-apple rust, good resistance to scab and mildew, fair resistance to fireblight, highly resistant to Japanese beetles

---



**Cultivar:** *Malus* 'Harvest Gold'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white, double

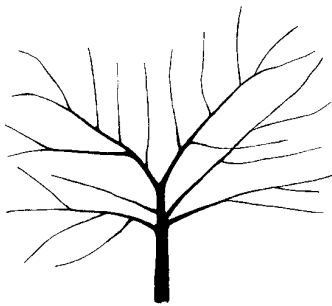
**Fruit:** gold, abundant, persistent, 3/4"

**Leaves:** green

**Other:** buds rose red

**Insect/Disease:** resistant to scab, fireblight, rust, powdery mildew, good resistance to Japanese beetles

---



**Cultivar:** *Malus* 'Henry Kohankie'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** pink-white

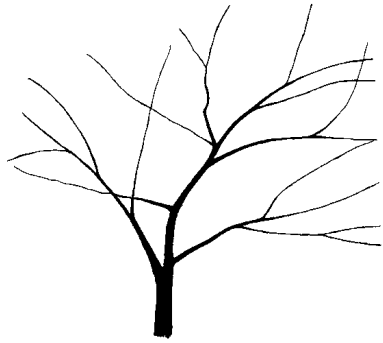
**Fruit:** glossy red, ellipsoid, persistent, edible, 1 1/4"

**Leaves:** dark green, large, lobed

**Other:** buds pink

**Insect/Disease:** reportedly disease free

---



**Cultivar:** *Malus* 'Indian Summer'

**Zone:** 4a - 8a

**Ornamental characteristics:**

**Height:** 18'

**Shape:** round

**Flowers:** rose red

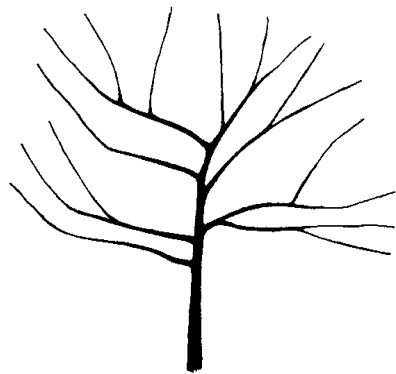
**Fruit:** bright red, persistent, 5/8"

**Leaves:** bronze green

**Other:** buds purple

**Insect/Disease:** excellent resistance to cedar-apple rust, mildew and fireblight, good resistance to scab

---



**Cultivar:** *Malus* 'Liset'

**Zone:** 4a - 7b

**Ornamental characteristics:**

**Height:** 15'

**Shape:** columnar

**Flowers:** pink-red, 1 1/2"

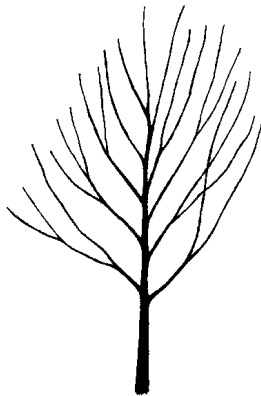
**Fruit:** dark red, 1/2"

**Leaves:** reddish aging to bronze green

**Other:** buds crimson, blooms as young tree

**Insect/Disease:** excellent resistance to cedar-apple rust, good resistance to scab and fireblight, fair resistance to mildew, resistant to frog eye leaf spot, very susceptible to Japanese beetles

---



**Cultivar:** *Malus* 'Madonna'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** columnar

**Flowers:** white, large, double, early, fragrant

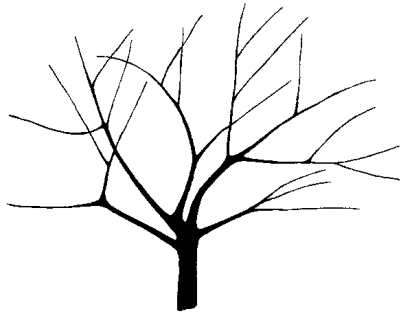
**Fruit:** gold-red, 5/8"

**Leaves:** bronze aging to dark green

**Other:** buds white, heavy bloomer

**Insect/Disease:** resistant to gypsy moth, fall cankerworm, eastern tent caterpillar, apple skeletonizer, apple aphid, rose chafer, disease resistant foliage

---



**Cultivar:** *Malus* 'Ormiston Roy'

**Zone:** 4a - 7a

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white

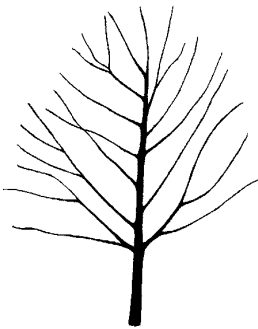
**Fruit:** yellow-orange, persistent, 3/8"

**Leaves:** green

**Other:** buds rose-red turning pale pink

**Insect/Disease:** excellent disease resistance cedar-apple rust, scab, and mildew, good resistance to fireblight, resistant to frog eye spot, good resistance to Japanese beetle

---



**Cultivar:** *Malus* 'Prairifire'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** pink-red

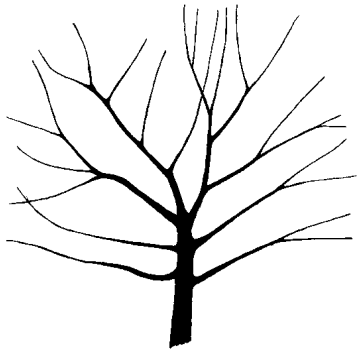
**Fruit:** orange-red, persistent, 3/8 - 1/2"

**Leaves:** reddish aging to reddish-green

**Other:** buds crimson

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight, scab and mildew, resistant to frog eye spot

---



**Cultivar:** *Malus* 'Professor Sprenger'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white, fragrant

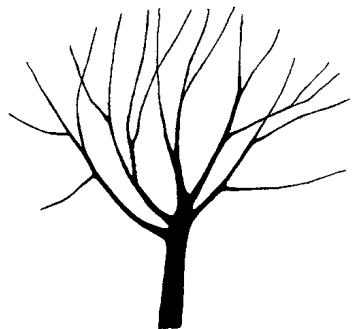
**Fruit:** orange red, persistent, 1/2"

**Leaves:** green

**Other:** buds pink

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight, scab and mildew

---



**Cultivar:** *Malus* 'Purple Prince'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** rose red

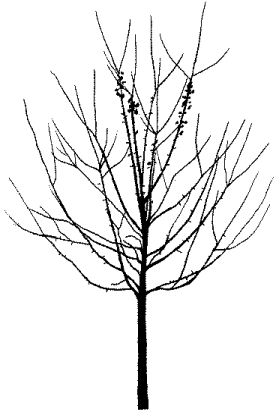
**Fruit:** maroon, persistent, 3/8 - 1/2"

**Leaves:** purple aging to bronze green

**Other:** buds bright carmine red, heavy annual bloomer

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight, mildew and scab

---



**Cultivar:** *Malus* 'Red Jewel'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 15'

**Shape:** oval

**Flowers:** white

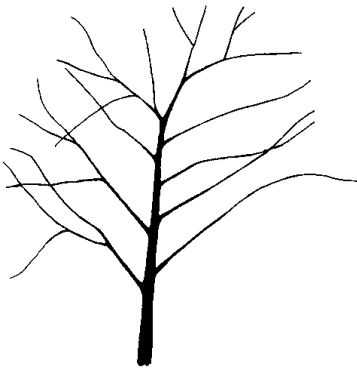
**Fruit:** brilliant red, persistent, 1/2"

**Leaves:** green

**Other:** buds pinkish to white

**Insect/Disease:** excellent resistance to cedar-apple rust, good resistance to scab and mildew, fair resistance to fireblight, resistant to frog eye leaf spot, gypsy moth, fall cankerworm, eastern tent caterpillar, apple skeletonizer, apple aphid, rose chafer

---



**Cultivar:** *Malus* 'Robinson'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 25'

**Shape:** oval, spreading with age

**Flowers:** deep pink

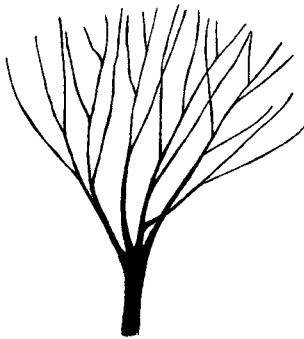
**Fruit:** dark, glossy red, 3/8"

**Leaves:** reddish aging to bronze-green

**Other:** buds crimson, good fall color, foliage hangs on late

**Insect/Disease:** excellent resistance to cedar-apple rust, fireblight and mildew, good resistance to scab

---



**Cultivar:** *Malus* 'Sentinel'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** narrow oval

**Flowers:** pink/white

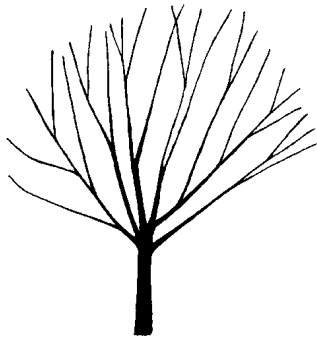
**Fruit:** bright red, persistent, 1/2"

**Leaves:** dark glossy green

**Other:** buds red

**Insect/Disease:** excellent resistance to cedar-apple rust and mildew, good resistance to scab and fireblight, resistant to frog eye leaf spot, very susceptible to Japanese beetle

---



**Cultivar:** *Malus* 'Silver Moon'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white, profuse, late

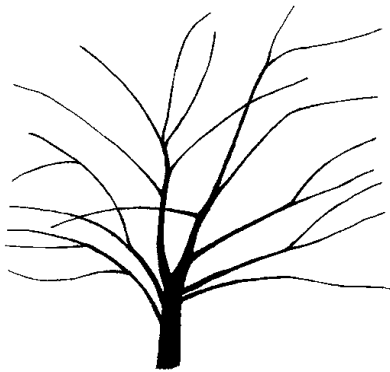
**Fruit:** deep red, persistent, 1/2"

**Leaves:** dark green

**Other:** buds white

**Insect/Disease:** resistant to scab, fireblight, rust, mildew, frog eye leaf spot, good resistance to Japanese beetle

---



**Cultivar:** *Malus* 'Strawberry Parfait'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** vase

**Flowers:** large pink, darker at edges

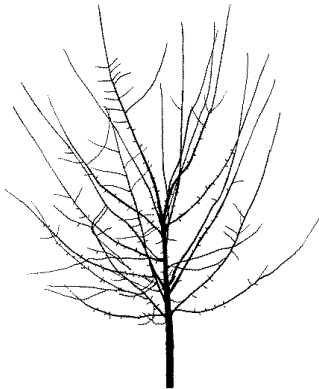
**Fruit:** yellow, 3/8"

**Leaves:** reddish aging to green

**Other:** buds red

**Insect/Disease:** excellent resistance to cedar-apple rust, scab and mildew, resistant to fireblight, frog eye leaf spot, highly resistant to Japanese beetle

---



**Cultivar:** *Malus* 'Sugartyme'

**Zone:** 4

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white, fragrant

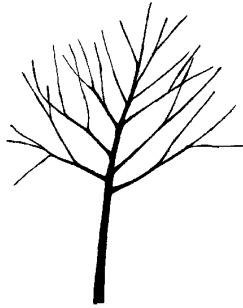
**Fruit:** red, persistent, 1/2"

**Leaves:** green

**Other:** buds pink

**Insect/Disease:** excellent resistance to cedar-apple rust and mildew, good resistance to scab, fair resistance to fireblight, resistant to frog eye leaf spot, gypsy moth, fall cankerworm, eastern tent caterpillar, apple skeletonizer, apple aphid, rose chafer

---



**Cultivar:** *Malus* 'White Angel'

**Zone:** 4a - 7a

**Ornamental characteristics:**

**Height:** 20'

**Shape:** oval

**Flowers:** white

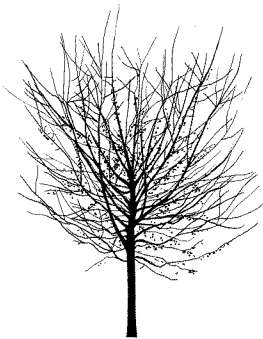
**Fruit:** red-scarlet, glossy, 1/2"

**Leaves:** dark glossy green

**Other:** buds pink

**Insect/Disease:** resistant to scab, fireblight, rust, frog eye leaf spot

---



**Cultivar:** *Malus x zumi* 'Calocarpa'

**Zone:** 4a - 8a

**Ornamental characteristics:**

**Height:** 20'

**Shape:** round

**Flowers:** white

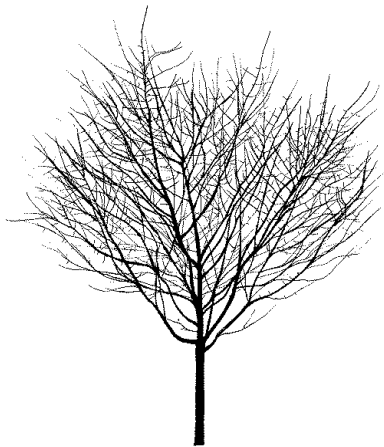
**Fruit:** bright red, persistent, 3/8"

**Leaves:** green, large

**Other:** buds deep red, dense canopy, birds relish fruit

**Insect/Disease:** excellent resistance to cedar-apple rust and scab, good resistance to mildew, fair resistance to fireblight

---



**Scientific name:** *Prunus* 'Accolade' (hybrid of *P. sargentii* and *P. subhirtella*)

**Common name:** Accolade Flowering Cherry

**Environmental characteristics:**

**Zone:** 5a

**Wet/dry:** requires moist, well drained soil

**Salt:**

**pH:** 5.0 - 7.5

**Other:** rapid grower for *Prunus*

**Insect/Disease:** potentially many pests, but apparently more resistant than most

**Ornamental characteristics:**

**Height:** 20' - 30'

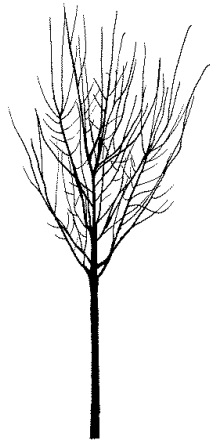
**Shape:** round to vase shaped, spreading

**Other:** deep rose-pink bud, semi-double pink flowers, attractive bark

**Cultivars:**

**Additional:** transplant in spring

---



*P. virginiana* 'Canada Red'

**Scientific name:** *Prunus virginiana* 'Canada Red'

**Common name:** Canada Red Chokecherry

**Environmental characteristics:**

**Zone:** 2b - 7a

**Wet/dry:** tolerates moderate drought

**Salt:**

**pH:** 5.0 - 7.5

**Other:** rapid growth rate

**Insect/Disease:** potential problems for *Prunus*, but apparently more resistant than most, resistant to Japanese beetle

**Ornamental characteristics:**

**Height:** 20'

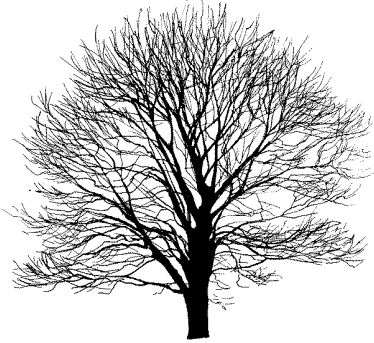
**Shape:** oval

**Other:** white flowers, new foliage green maturing to dark maroon, edible fruit

**Cultivars:** also known as 'Schubert'

**Additional:** transplant in spring or fall, easy to establish

---



**Scientific name:** *Sorbus intermedia*

**Common name:** Swedish Mountain Ash

**Environmental characteristics:**

**Zone:** 5 or 6a - 8a

**Wet/dry:** tolerates drought

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** less susceptible to pests than European Mountain Ash (*Sorbus aucuparia*)

**Ornamental characteristics:**

**Height:** 25'

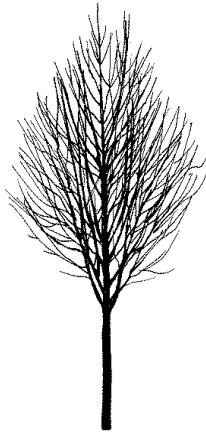
**Shape:** round

**Other:** orange-red fall color

**Cultivars:**

**Additional:** transplant in spring, easy to transplant

---



**Scientific name:** *Sorbus thuringiaca* (fastigiata)

**Common name:** Columnar Oakleaf Mountain Ash

**Environmental characteristics:**

**Zone:** 3b - 7b

**Wet/dry:**

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 25'

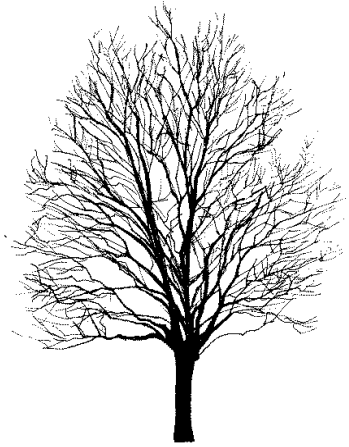
**Shape:** upright

**Other:** orange fall color

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Syringa reticulata*

**Common name:** Japanese Tree Lilac

**Environmental characteristics:**

**Zone:** 3a - 7b

**Wet/dry:** intolerant of standing water, tolerates drought

**Salt:** moderate tolerance

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** resistant to powdery mildew, borers and scale may be problematic in warmer regions

**Ornamental characteristics:**

**Height:** 25'

**Shape:** oval

**Other:** large cream colored flowers in late June. suitable for large containers

**Cultivars:** 'Ivory Silk' (upright habit, dense, compact, 20' - 26', heavy flowering), 'Summer Silk' (round, compact, 16' - 20', heavy flowering)

**Additional:** transplant in spring or fall

---

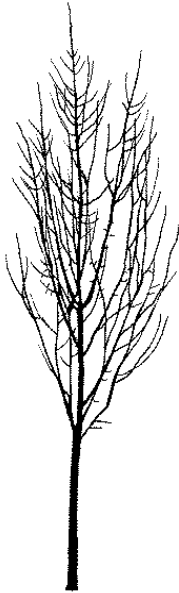
## ORNAMENTAL CHARACTERISTICS OF SELECTED DISEASE RESISTANT CRABAPPLES

Cultivar	Zone	Ht	Shape	Color			
				Bud	Flower	Fruit	Leaf
Adams	4a	20'	round	deep pink	deep pink, profuse	red, persistent, 5/8"	green with red tint
Adirondack	4	18'	vase	carmine	white, textured	bright red, 1/2"	dark green, leathery
<i>baccata Jackii</i>	3a	20'	round	white	white, fragrant, early	deep red-purple, 3/8"	glossy green
Baskatong	4	25'	oval	dark purple	red-purple	dark red, 1"	purple changing to bronze
Centurion	4	20'	narrow oval	dark red	rose red	bright red, persistent, 5/8"	reddish changing to green
Dolgo	3b	30'	oval	white	white	bright red, edible, 1 1/2"	glossy green
Donald Wyman	4	20'	round	pink	white, abundant	bright red, persistent 3/8"	dark green
Doubloons	4	20'	dense oval	carmine	white, double	yellow, persistent, 3/8"	deep green
<i>floribunda</i>	4b	20'	round	carmine	pink-white, large	yellow/red, 3/8"	green, small
Harvest Gold	4	20'	oval	rose red	white	gold, persistent, 3/4"	green
Henry Kohankie	4	20'	round	pink	pink-white	red, persistent, 1 1/4"	dark green, large, lobed
Indian Summer	4a	18'	round	purple	rose red	bright red, persistent, 5/8"	bronze green
Liset	4a	15'	columnar	crimson	pink-red, large	dark red, 1/2"	reddish aging to bronze green
Madonna	4	20'	columnar	white	white, large, fragrant	gold red, 5/8"	bronze aging to dark green
Ormiston Roy	4a	20'	oval	rose to pink	white	yellow, persistent, 3/8"	green
Prairifire	4	20'	oval	crimson	pink-red	orange-red, persistent, 1/2"	reddish aging to reddish-green
Professor Sprenger	4	20'	oval	pink	white, fragrant	orange-red persistent, 1/2"	green
Purple Prince	4	20'	round	carmine	rose red	maroon, persistent, 3/8"	purple aging to bronze
Red Jewel	4	15'	oval	pink to white	white	bright red, persistent, 1/2"	green
Robinson	4	25'	oval	crimson	deep pink	dark glossy red, 3/8"	reddish aging to bronze green
Sentinel	4	20'	narrow oval	red	pink/white	bright red, persistent, 1/2"	dark glossy green
Silver Moon	4	20'	oval	white	white, profuse, late	deep red persistent, 1/2"	dark green
Strawberry Parfait	4	20'	vase	red	pink, large	yellow, 3/8"	reddish aging to green
Sugartyme	4	20'	oval	pink	white, fragrant	red persistent, 1/2"	green
White Angel	4a	20'	oval	pink	white	red-scarlet, glossy, 1/2"	dark glossy green
x zumi Calocarpa	4a	20'	round	deep red	white	bright red, persistent, 3/8"	green

Urban Horticulture Institute, Cornell University, Ithaca, NY February, 1998

## II. MEDIUM TO LARGE TREES THAT DO WELL IN CITY ENVIRONMENTS

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*A. x freemanii* 'Armstrong'

**Scientific name:** *Acer x freemanii*

**Common name:** Freeman Maple

**Environmental characteristics:**

**Zone:** 4

**Wet/dry:** tolerates intermittent wet sites as well as intermittent drought

**Salt:** moderate tolerance

**pH:** 5.0 - 7.4

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 45' -70'

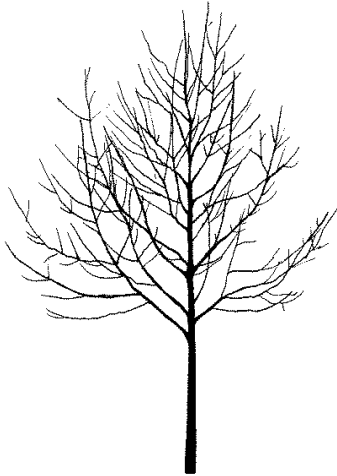
**Shape:** see cultivars

**Other:** red/yellow fall color

**Cultivars:** 'Armstrong' (upright, fast grower), 'Autumn Blaze' (compact, oval, orange-red fall color), 'Celebration' (seedless, compact, upright, strong branching, golden-yellow fall color), 'Marmo' (broad columnar, excellent fall color, colors early), 'Morgan' (open, fast growing, outstanding orange-red to red fall color), 'Scarlet Sentinel' (columnar, fast growing, yellow-orange to orange red fall color)

**Additional:** transplant in spring or fall

---



*A. platanoides* 'Superform'

**Scientific name:** *Acer platanoides*

**Common name:** Norway Maple

**Environmental characteristics:**

**Zone:** 4a - 7b

**Wet/dry:** tolerates intermittent poor drainage as well as intermittent drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** may naturalize when planted next to open areas

**Insect/Disease factors:** 'Parkway' tolerant of verticillium wilt; 'Summershade' tolerant of leaf hoppers

**Ornamental characteristics:**

**Height:** 40' - 50'

**Shape:** see below

**Other:** yellow fall color

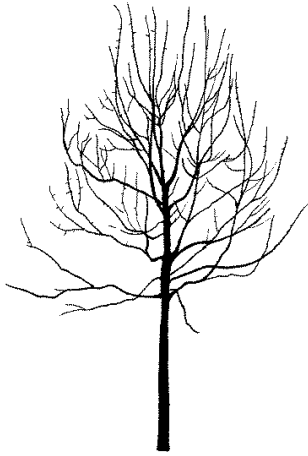
**Cultivars:** many cultivars available, among them are:

**Broad spreading:** 'Emerald Queen' (golden fall color), 'Summershade' (zone 4b, heavy, leathery foliage, very heat tolerant), 'Superform' (very symmetrical)

**Narrow upright:** 'Cleveland' (narrow, oval, excellent golden-yellow fall color), 'Columnare' (narrower than 'Cleveland'), 'Parkway' (oval).

**Additional:** tends to heave sidewalks unless adequate rooting space is provided, easy to transplant in spring or fall

---



**Scientific name:** *Acer pseudoplatanus*

**Common name:** Sycamore Maple

**Environmental characteristics:**

**Zone:** 5b - 7b

**Wet/dry:** tolerates intermittent poor drainage and intermittent drought

**Salt:** very tolerant of soil or air-borne salt

**pH:** 5.0 - 8.2

**Other:** care should be taken when planting next to parks or natural areas as the species naturalizes freely

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 40' - 60'

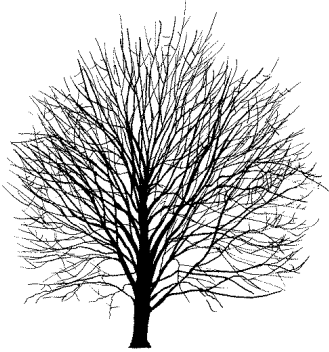
**Shape:** upright spreading

**Other:** more leathery foliage than *A. platanoides*, orange brown scaly bark

**Cultivars:** 'Spaethii' (underside of leaves are purple)

**Additional:** popular street tree in Europe, transplant in spring

---



**Scientific name:** *Acer rubrum*

**Common name:** Red Maple

**Environmental characteristics:**

**Zone:** 3b - 9a

**Wet/dry:** moist soils necessary, flood tolerance of specific cultivars is listed below

**Salt:** sensitive

**pH:** 5.0 - 7.0

**Other:** should be used only in sites with little environmental stress

**Insect/Disease factors:**

**Ornamental characteristics:** good fall color

**Height:** 40' - 60'

**Shape:** see below

**Other:** should be specified as 'own-rooted' as graft incompatibility can be a problem

**Cultivars:**

Shape:

Round upright: 'Autumn Flame' (early, persistent red fall color, zone 3b), 'Northwood' (good orange-red fall color, zone 3b) 'October Glory' (excellent red fall color, zone 5a), 'Red Skin' (large, thick foliage, early reddish maroon fall color, zone 4), 'Red Sunset' (excellent orange to red fall color, zone 4)

Narrow upright: 'Bowhall' (orange fall color), 'Karpick' (dense, red twigs, yellow or red fall color)

Flood Tolerance:

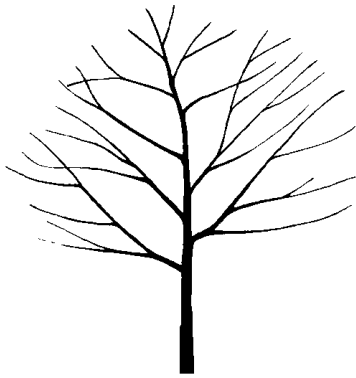
High tolerance: 'Red Sunset', 'Bowhall'

Medium tolerance: 'Autumn Flame', 'October Glory'

Low tolerance: 'Karpick', 'Northwood'

**Additional:** transplant in spring

---



*A. x carnea* 'Briotti'

**Scientific name:** *Aesculus x carnea*

**Common name:** Red Horsechestnut

**Environmental characteristics:**

**Zone:** 5a - 8b

**Wet/dry:** requires moist, well drained sites

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** less susceptible to leaf scorch and blotch than common horse chestnuts

**Ornamental characteristics:**

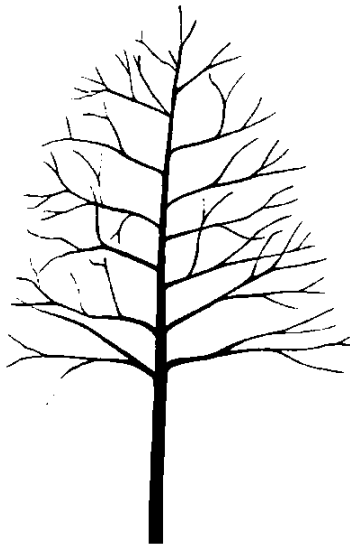
**Height:** 40' - 50'

**Shape:** round

**Other:** pink to red flowers in May, fruit may be a problem in some areas

**Cultivars:** 'Briotti' (large, bright red flowers, deep green foliage), 'O'Neill' (finer red flowers)

**Additional:** transplant in spring



**Scientific name:** *Alnus glutinosa*

**Common name:** Black Alder

**Environmental characteristics:**

**Zone:** 4a - 8b

**Wet/dry:** tolerates wet sites

**Salt:** moderate tolerance

**pH:** 5.0 - 7.5

**Other:** tolerates light shade, used for windbreaks, fixes own nitrogen

**Insect/Disease factors:** may have problems with leaf miners, tent caterpillars, woolly alder aphids

**Ornamental characteristics:**

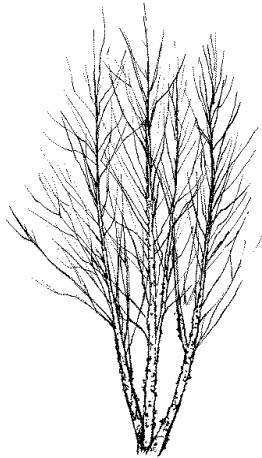
**Height:** 40' - 60'

**Shape:** pyramidal to oval

**Other:**

**Cultivars:** 'Pyramidalis' (narrowly pyramidal, somewhat denser and lower branched), 'Fastigiata'

**Additional:** good tree for reclamation sites, transplants easily in spring, relatively short lived



*Betula nigra* clump form

**Scientific name:** *Betula nigra* 'Heritage'

**Common name:** Heritage River Birch

**Environmental characteristics:**

**Zone:** 4b - 9a

**Wet/dry:** moist, well drained but adaptable

**Salt:**

**pH:** 5.0 - 7.0

**Other:**

**Insect/Disease factors:** resistant to birch leaf miner and bronze birch borer

**Ornamental characteristics:**

**Height:** 50' - 80'

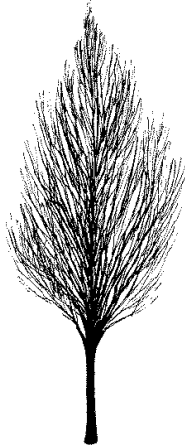
**Shape:** oval

**Other:** peeling pinkish white bark when older

**Cultivars:** 'Heritage' strongly exfoliating, paler pink bark, vigorous grower

**Additional:** transplant in spring

---



**Scientific name:** *Carpinus betulus* 'Fastigiata'

**Common name:** European Hornbeam

**Environmental characteristics:**

**Zone:** 5a - 7a

**Wet/dry:** tolerates drought, heavy soil

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 40' - 60'

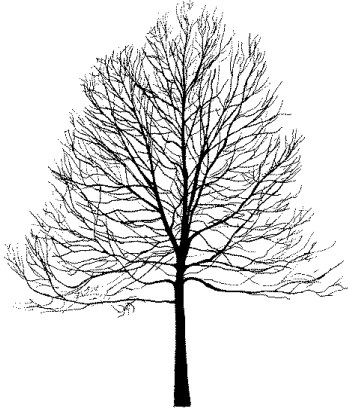
**Shape:** upright, oval

**Other:** narrow branching angles

**Cultivars:**

**Additional:** transplant in spring, somewhat slow to establish from bare root

---



**Scientific name:** *Celtis occidentalis*

**Common name:** Hackberry

**Environmental characteristics:**

**Zone:** 3b - 8b

**Wet/dry:** tolerates drought

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:** tolerates light shade, wind, heat

**Insect/Disease factors:** may develop witches' broom

**Ornamental characteristics:**

**Height:** 40' - 60'

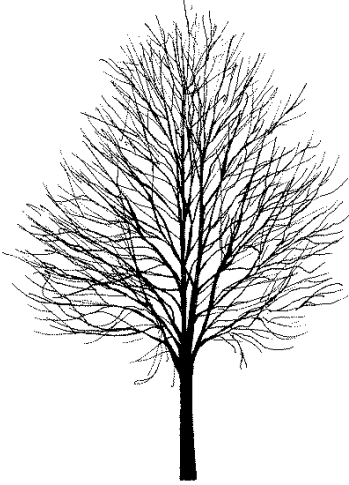
**Shape:** pyramidal when young, open, irregular when mature

**Other:** dark green, leathery leaves

**Cultivars:** 'Prairie Pride' (rapid compact grower, thick leathery foliage)

**Additional:** transplant in spring, somewhat slow to establish

---



**Scientific name:** *Cercidiphyllum japonicum*

**Common name:** Katsura Tree

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** requires evenly moist soils, not drought tolerant

**Salt:**

**pH:** 5.0 - 8.2

**Other:** does not tolerate compaction or heavy soils, tolerates light shade, protected site best

**Insect/Disease factors:** relatively pest free

**Ornamental characteristics:**

**Height:** 50' - 80'

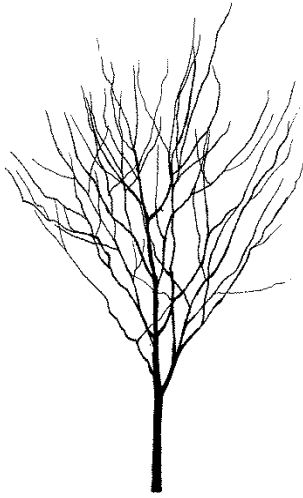
**Shape:** round, upright

**Other:** new leaves bright red when unfolding, good yellow fall color, dry leaves have caramel scent, clump or single stem

**Cultivars:**

**Additional:** transplant in spring or fall

---



**Scientific name:** *Cladrastis kentukea*

**Common name:** Yellowwood

**Environmental characteristics:**

**Zone:** 4b - 8a

**Wet/dry:** best in moist, well drained soils, not drought tolerant

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** relatively trouble free

**Ornamental characteristics:**

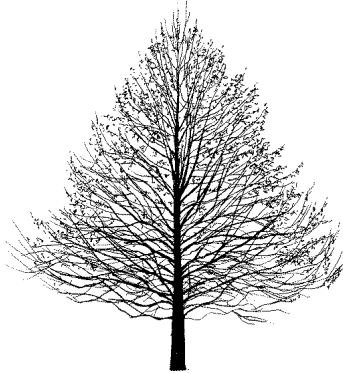
**Height:** 30' - 50'

**Shape:** round

**Other:** showy, fragrant flowers in late spring

**Cultivars:**

**Additional:** prune only in summer as profuse bleeding will occur at other times of the year, specify single leader, can be weak wooded with poor crotch angles that split out as the trees grow older, transplant in spring.



**Scientific name:** *Corylus colurna*

**Common name:** Turkish Filbert

**Environmental characteristics:**

**Zone:** 5a - 8b

**Wet/dry:** tolerates moderate drought once established

**Salt:**

**pH:** 5.0 - 8.2

**Other:** tolerates heat once established

**Insect/Disease factors:** fairly pest free

**Ornamental characteristics:**

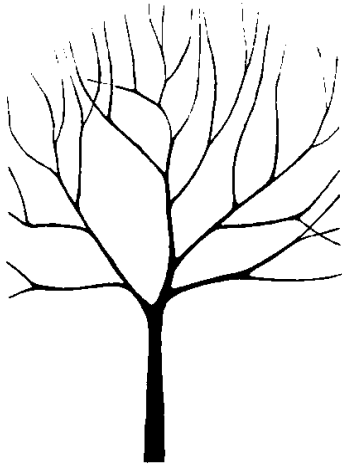
**Height:** 50' - 70'

**Shape:** pyramidal

**Other:** soft, corky bark on new growth

**Cultivars:**

**Additional:** transplant in spring balled and burlaped or containerized only, do not transplant bare root



**Scientific name:** *Eucommia ulmoides*

**Common name:** Hardy Rubber Tree

**Environmental characteristics:**

**Zone:** 5b - 8b

**Wet/dry:** tolerates drought, intolerant of poor drainage

**Salt:**

**pH:** 5.0 - 8.2

**Other:** tolerates heat, needs full sun

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 40' - 60'

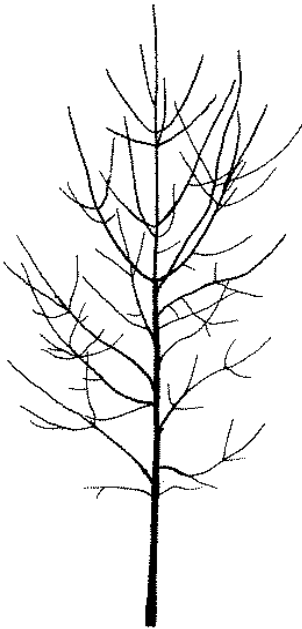
**Shape:** round, wide spreading

**Other:** glossy green foliage

**Cultivars:**

**Additional:** transplants readily in spring or fall

---



**Scientific name:** *Fraxinus americana*

**Common name:** White Ash

**Environmental characteristics:**

**Zone:** 4a - 9a

**Wet/dry:** tolerates intermittent flooding

**Salt:**

**pH:** 5.0 - 8.2

**Other:** needs full sun

**Insect/Disease factors:** in some areas ash yellows and insect problems may be a hazard

**Ornamental characteristics:**

**Height:** 50' - 70'

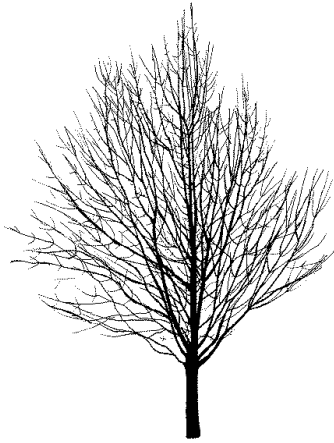
**Shape:** oval

**Other:** good reddish to purple fall color

**Cultivars:** 'Autumn Applause', (long lasting maroon fall color), 'Autumn Purple' (non-fruiting, fast growing, good form and reddish purple fall color, zone 5a), 'Champaign County' (tight, dense crown, not much fall color), 'Rose Hill' (non-fruiting, good form, upright branching, red-purple fall color, resistant to frost cracking, zone 5b)

**Additional:** transplant in spring or fall

---



**Scientific name:** *Fraxinus excelsior* 'Hessei'

**Common name:** European Ash

**Environmental characteristics:**

**Zone:** 4b - 8b

**Wet/dry:** tolerates intermittent wet, flooding

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** may be more resistant to borers than species

**Ornamental characteristics:**

**Height:** 60'

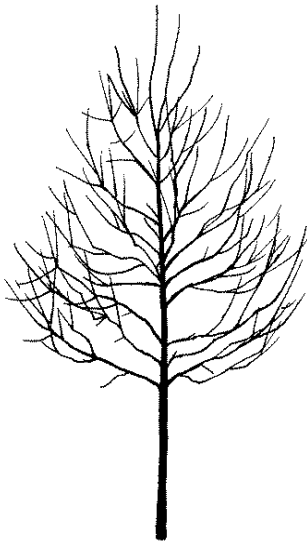
**Shape:** round

**Other:** very vigorous, leaves stay green long

**Cultivars:**

**Additional:** transplant in spring or fall

---



**Scientific name:** *Fraxinus pennsylvanica*

**Common name:** Green Ash

**Environmental characteristics:**

**Zone:** 2a - 9a

**Wet/dry:** tolerates intermittent flooding and moderate drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** adaptable to wide range of urban conditions

**Insect/Disease factors:** resistant to anthracnose, borers can be a problem in hot, dry environments

**Ornamental characteristics:**

**Height:** 50' - 60'

**Shape:** oval, pyramidal

**Other:** yellow fall color

**Cultivars:** 'Bergeson' (upright, rapid grower, zone 3b),

'Newport' (non-fruiting, good form, zone 3b), 'Patmore'

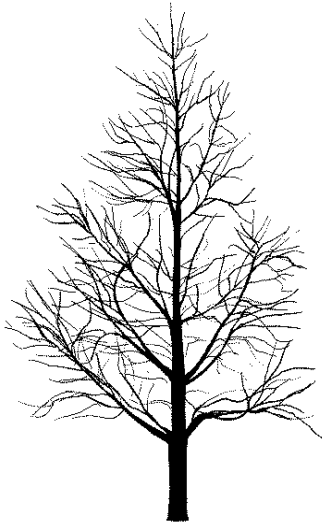
(non-fruiting, upright, zone 3a), 'Summit' (upright, fine-textured foliage, excellent golden yellow fall color, zone 3b),

'Urbanite' (compact, pyramidal, thick, leathery foliage, bronze fall color, bark resistant to sun scald zone 5b)

**Additional:** transplant in spring or fall

---

*F. pennsylvanica* 'Patmore'



**Scientific name:** *Ginkgo biloba* (male only)

**Common name:** Gingko

**Environmental characteristics:**

**Zone:** 4b - 8b

**Wet/dry:** tolerates drought

**Salt:** moderate tolerance

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 60' - 100'

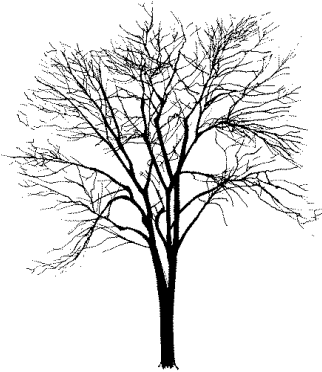
**Shape:** irregular when young, pyramidal with age

**Other:** yellow fall color

**Cultivars:** 'Autumn Gold' ( symmetrical, broad, outstanding fall color), 'Lakeview' and 'Princeton Sentry' (very narrow upright)

**Additional:** specify male trees only because of noxious fruit smell, all cultivars are male, transplant in spring or fall

---



**Scientific name:** *Gleditsia triacanthos inermis*

**Common name:** Thornless Honeylocust

**Environmental characteristics:**

**Zone:** 4b - 9a

**Wet/dry:** tolerates wet and dry sites

**Salt:** high tolerance

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** over planting has encouraged severe insect problems in many areas (Honeylocust plant bug, spider mite, borer, webworm).

**Ornamental characteristics:**

**Height:** 40' - 100'

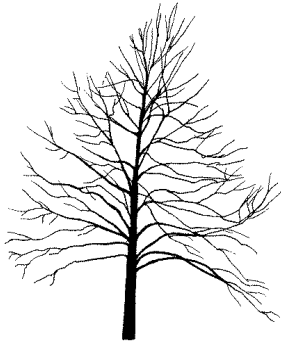
**Shape:** open, spreading

**Other:** yellow fall color

**Cultivars:** 'Halka' (essentially fruitless, zone 4a), 'Shademaster' (high vase shaped canopy, essentially fruitless, zone 3b), 'Skyline' (upright, pyramidal, strong central leader, good fall color, zone 3b)

**Additional:** transplants easily in spring

---



**Scientific name:** *Gymnocladus dioica*

**Common name:** Kentucky Coffeetree

**Environmental characteristics:**

**Wet/dry:** tolerates drought

**Zone:** 4a - 9a

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 70' - 80'

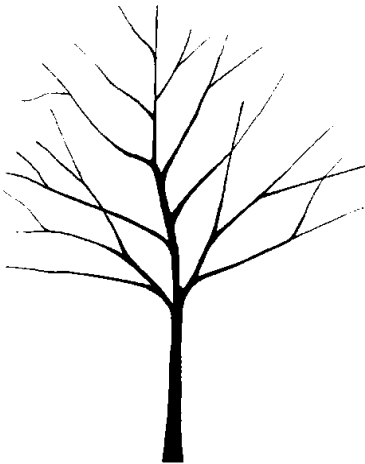
**Shape:** oval, spreading

**Other:** use of male tree eliminates fruit litter, sparse branching when young

**Cultivars:** 'Espresso' (male fruitless form)

**Additional:** transplant in spring or fall

---



**Scientific name:** *Koelreuteria paniculata*

**Common name:** Goldenraintree

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** tolerates heat

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 30' - 40'

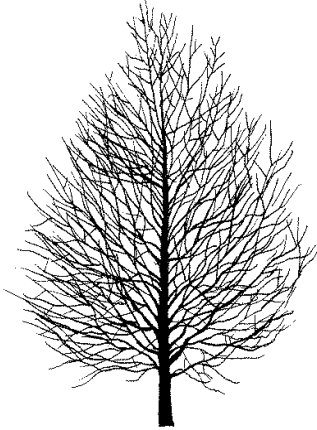
**Shape:** round

**Other:** yellow flower clusters in mid-summer, specify straight trunk and good branch structure or tag at nursery

**Cultivars:** 'September' (later flowering)

**Additional:** some what weak wooded, transplant in spring

---



**Scientific name:** *Liquidambar styraciflua*

**Common name:** Sweetgum

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates intermittent flooding, moderate drought

**Salt:**

**pH:** 5.0 - 7.5

**Other:** best on moist, sunny sites

**Insect/Disease factor:** relatively pest free

**Ornamental characteristics:**

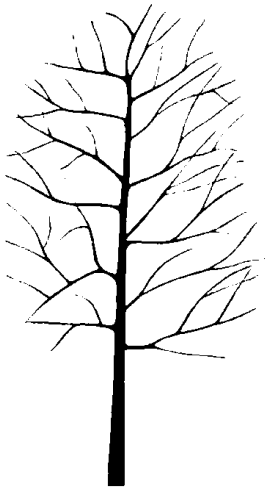
**Height:** 70' - 100'

**Shape:** pyramidal when young, round with age

**Other:** excellent fall color, fruit litter may be objectionable

**Cultivars:** 'Moraine' (most cold hardy, zone 4b, bright red fall color), 'Rotundaloba' (fruitless, not as hardy)

**Additional:** northern seed source recommended, transplant in spring



**Scientific name:** *Liriodendron tulipifera*

**Common name:** Tulip Tree

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** requires evenly moist soils

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:** does not tolerate poor drainage

**Insect/Disease factors:** relatively pest free

**Ornamental characteristics:**

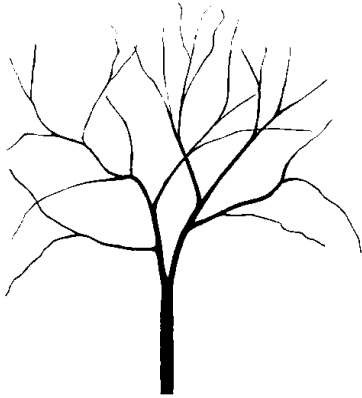
**Height:** 80' - 120'

**Shape:** broad pyramidal

**Other:** needs adequate space, yellow fall color

**Cultivars:**

**Other:** northern seed source recommended, somewhat weak wooded, transplant in spring



**Scientific name:** *Maclura pomifera inermis* (male)

**Common name:** Osage Orange

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates drought and wet sites

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** adaptable to wide range of soils

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 30' - 50'

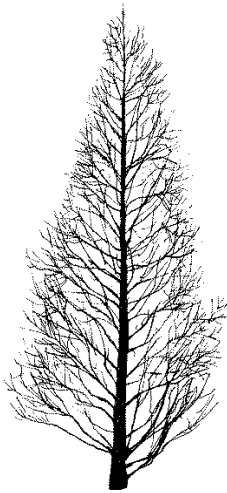
**Shape:** irregular

**Other:** useful as a wind break, spiny branches may be a litter problem, specify male plants only

**Cultivars:** 'Park' (nonspiny male), 'Wichita'

**Additional:** transplant in spring or fall

---



**Scientific name:** *Metasequoia glyptostroboides*

**Common name:** Dawn Redwood

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** requires moist sites, will not tolerate dry sites

**Salt:** sensitive

**pH:** 5.0 - 7.5

**Other:**

**Insect/Disease factors:** relatively pest free

**Ornamental characteristics:**

**Height:** 70' - 100'

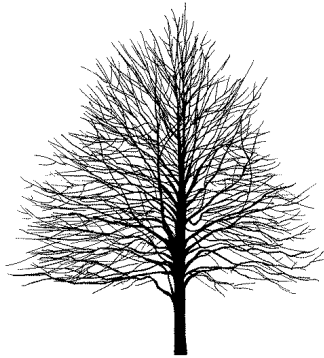
**Shape:** pyramidal

**Other:** lower branches need to be removed for street side use, fast growing

**Cultivars:**

**Additional:** transplant in spring or fall

---



**Scientific name:** *Nyssa sylvatica*

**Common name:** Tupelo

**Environmental characteristics:**

**Zone:** 5a - 9a+

**Wet/dry:** tolerates wet sites, intermittent drought

**Salt:** relatively tolerant

**pH:** 5.5 - 7.0

**Other:**

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 40' - 70'

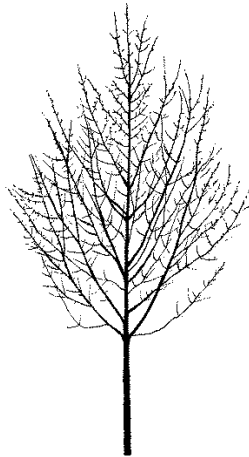
**Shape:** pyramidal

**Other:** bright red fall color

**Cultivars:**

**Other:** difficult to transplant - use small sizes, balled and burlaped, only, slow to recover from transplanting, transplant in spring

---



**Scientific name:** *Ostrya virginiana*

**Common name:** American Hophornbeam

**Environmental characteristics:**

**Zone:** 3b - 9a

**Wet/dry:** prefers moist but will tolerate moderately dry soils once established

**Salt:** very sensitive

**pH:** 5.0 - 8.2

**Other:** tolerates light shade

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 30' - 50'

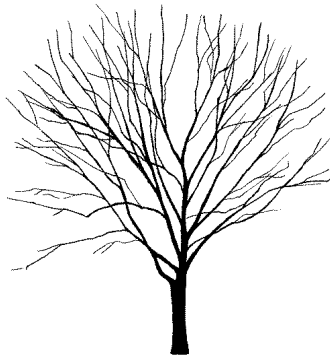
**Shape:** oval

**Other:** slow growing

**Cultivars:**

**Additional:** slow to recover from transplanting, transplant in spring

---



**Scientific name:** *Phellodendron amurense*

**Common name:** Amur Corktree

**Environmental characteristics:**

**Zone:** 4b - 7b

**Wet/dry:** favors moist, well drained sites, tolerates intermittent drought

**Salt:**

**pH:** 5.0 - 8.2

**Other:** does not do well in restricted root zone areas

**Insect/Disease factors:** pest free

**Ornamental characteristics:**

**Height:** 30' - 40'

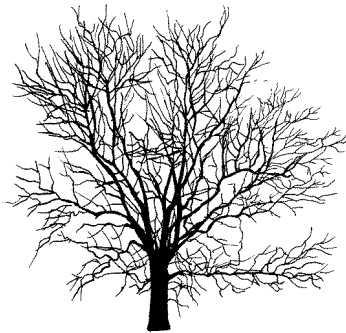
**Shape:** round, open with massive branches

**Other:** corky, furrowed bark

**Cultivars:** 'Macho' (vigorous male, thick leathery leaves, fruitless)

**Additional:** transplant in spring

---



*P. x acerifolia* 'Bloodgood'

**Scientific name:** *Platanus x acerifolia*

**Common name:** London Planetree

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates wet and intermittently flooded sites, drought tolerant

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** over planting has encouraged disease and insect problems in NYC, 'Columbia' & 'Liberty' resistant to anthracnose & powdery mildew, 'Bloodgood' moderately resistant, Cankerstain may be a problem

**Ornamental characteristics:**

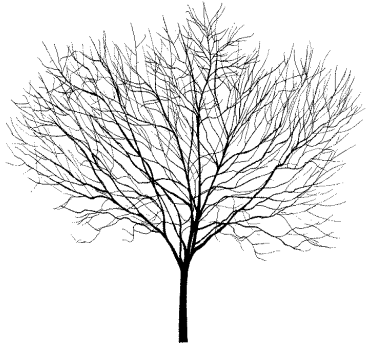
**Height:** 70' - 100'

**Shape:** pyramidal when young, open, spreading with age

**Cultivars:** 'Bloodgood' (tolerates severe pruning, rapid grower), 'Columbia', 'Liberty'

**Additional:** transplant in spring or fall

---



**Scientific name:** *Prunus sargentii*

**Common name:** Sargent Cherry

**Environmental characteristics:**

**Zone:** 4b - 9a

**Wet/dry:** requires moist, well drained soil, will tolerate intermittent drought

**Salt:** tolerant

**pH:** 5.0 - 7.5

**Other:**

**Insect/Disease factors:** none incapacitating

**Ornamental characteristics:**

**Height:** 40' - 50'

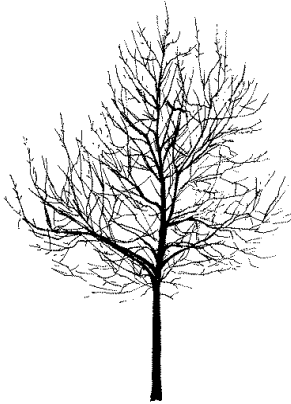
**Shape:** vase, round with age

**Other:** hardy flower buds, early pink flowers, attractive bark, bronze red fall color

**Cultivars:** 'Columnaris' (narrower form)

**Additional:** transplant in spring

---



*P. calleryana*  
'Autumn Blaze'

**Scientific name:** *Pyrus calleryana*

**Common name:** Callery Pear

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** tolerates drought and intermittent poor drainage

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** tolerates heavy soils

**Insect/Disease factors:** 'Autumn Blaze' 'Cleveland Select', 'Fauriei' & 'Whitehouse' tolerant to fireblight, 'Aristocrat' susceptible to fireblight

**Ornamental characteristics:**

**Height:** 30' - 50'

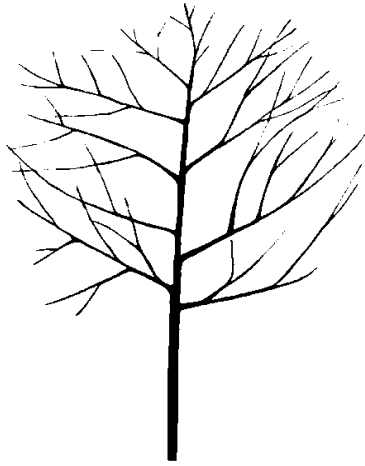
**Shape:** round, pyramidal

**Other:** white flowers in April, graft incompatibility can be a problem, cultivar 'Bradford' is no longer recommended because of tendency for severe limb breakage

**Cultivars:** 'Aristocrat' (upright, vigorous, good branching angles, later blooming, good fall color), 'Autumn Blaze' (good branching angles, early bright red fall color, most cold hardy), 'Chanticleer' ('Cleveland Select') (narrow pyramidal, early gold-red to plum fall color, heavy flowering), 'Fauriei' (showy flowers), 'Whitespire' (small)

**Additional:** transplant in spring

---



**Scientific name:** *Quercus acutissima*

**Common name:** Sawtooth Oak

**Environmental characteristics:**

**Zone:** 5b or 6a - 9a

**Wet/dry:** tolerates moderately dry soils

**Salt:** moderate tolerance

**pH:** 5.0 - 7.5

**Other:** good growth rate in moist sites

**Insect/Disease factors:** reasonably pest free, preferred by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 40' - 50'

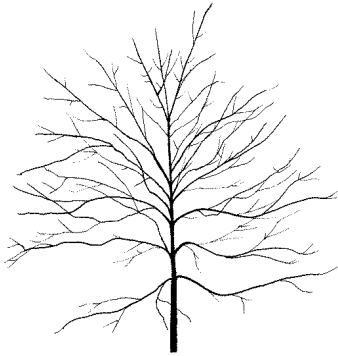
**Shape:** broad oval

**Other:**

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Quercus bicolor*

**Common name:** Swamp White Oak

**Environmental characteristics:**

**Zone:** 4a - 8b

**Wet/dry:** tolerates temporary flooding, wet soils and somewhat dry soils

**Salt:** sensitive

**pH:** 5.0 - 7.0

**Other:** variable susceptibility to iron chlorosis

**Insect/Disease factors:** susceptible to anthracnose, intermediate preference by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 50' - 60'

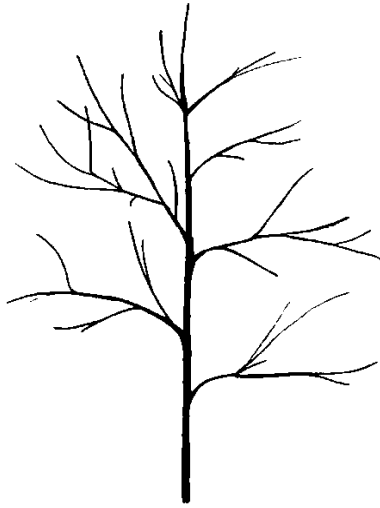
**Shape:** broad oval with round top

**Other:**

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Quercus imbricaria*

**Common name:** Shingle Oak

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** prefers moist but will tolerate intermittent drought

**Salt:**

**pH:** 5.0 - 7.5

**Other:**

**Insect/Disease factors:** anthracnose, canker, powdery mildew, rust, wilt, galls, scales, borers, miners, etc. may be a problem

**Ornamental characteristics:**

**Height:** 40' - 60'

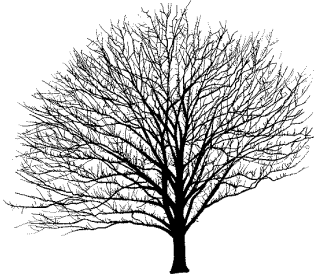
**Shape:** round

**Other:**

**Cultivars:**

**Additional:** slow to recover from transplanting, transplants well in spring

---



**Scientific name:** *Quercus macrocarpa*

**Common name:** Bur Oak

**Environmental characteristics:**

**Zone:** 3a - 9a

**Wet/dry:** tolerates drought and intermittent flooding

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** susceptible to anthracnose, intermediate preference by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 60' - 80'

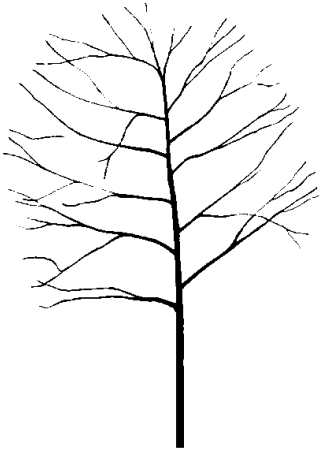
**Shape:** round

**Other:** slow growing massive trees needing adequate space, corky bark

**Cultivars:**

**Additional:** transplant small sizes in spring

---



**Scientific name:** *Quercus muehlenbergii*

**Common name:** Chinkapin Oak

**Environmental characteristics:**

**Zone:** 5a - 8b

**Wet/dry:** tolerates moderate drought

**Salt:**

**pH:** 5.0 - 8.2

**Other:** extremely tolerant of alkaline soil

**Insect/Disease factors:** no serious pests

**Ornamental characteristics:**

**Height:** 30' - 50'

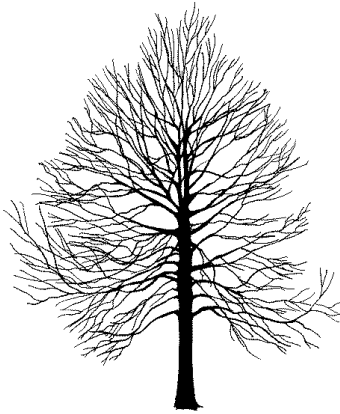
**Shape:** round

**Other:**

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Quercus palustris*

**Common name:** Pin Oak

**Environmental characteristics:**

**Wet/dry:** tolerates wet soils and intermittent drought

**Zone:** 5a - 8b

**Salt:** moderate to poor tolerance

**pH:** 5.5 - 6.0

**Other:** iron chlorosis on high pH soils

**Insect/Disease factors:** over planting has encouraged insect problems, resistant to anthracnose, preferred by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 50' - 70'

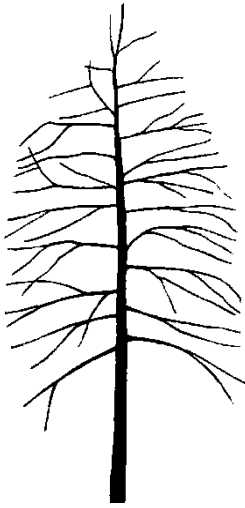
**Shape:** pyramidal, oval with age

**Other:** scarlet fall color

**Cultivars:** 'Crownright' (upright), 'Sovereign' (lower branches do not weep)

**Additional:** transplant in spring

---



**Scientific name:** *Quercus phellos*

**Common name:** Willow Oak

**Environmental characteristics:**

**Zone:** 6a - 9a

**Wet/dry:** tolerates temporary flooding and moderately dry soils

**Salt:**

**pH:** 5.0 - 7.0

**Other:** iron chlorosis on high pH soils

**Insect/Disease factors:** resistant to anthracnose, preferred by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 40' - 60'

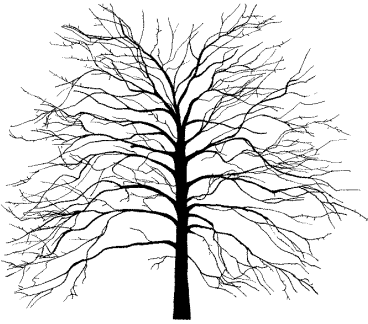
**Shape:** pyramidal, oval with age

**Other:** strong central leader

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Quercus robur*

**Common name:** English Oak

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates drought once established

**Salt:** good tolerance

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** powdery mildew can be a problem, susceptible to anthracnose

**Ornamental characteristics:**

**Height:** 50' - 60'

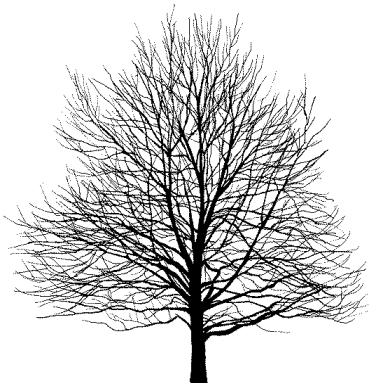
**Shape:** round

**Other:**

**Cultivars:** 'Attention' (columnar form, mildew resistant), 'Skymaster' (oval, purportedly mildew resistant), 'Fastigiata' (not recommended due to chlorosis on high pH soils)

**Additional:** transplant in spring

---



**Scientific name:** *Quercus rubra*

**Common name:** Northern Red Oak

**Environmental characteristics:**

**Zone:** 3b - 9a

**Wet/dry:** tolerates moderately dry sites once established

**Salt:** tolerant

**pH:** 5.0 - 7.4

**Other:**

**Insect/Disease factors:** oak wilt is a serious problem in more southern areas, resistant to anthracnose, preferred by orange-striped oakworm

**Ornamental characteristics:**

**Height:** 60' - 75'

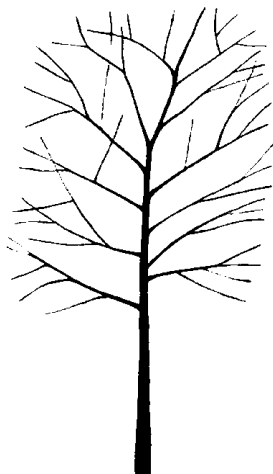
**Shape:** round

**Other:**

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Quercus shumardii*

**Common name:** Shumard Oak

**Environmental characteristics:**

**Zone:** 5b or 6a - 9a

**Wet/dry:** tolerates intermittent drought

**Salt:**

**pH:** 5.0 - 7.5

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 60' - 80'

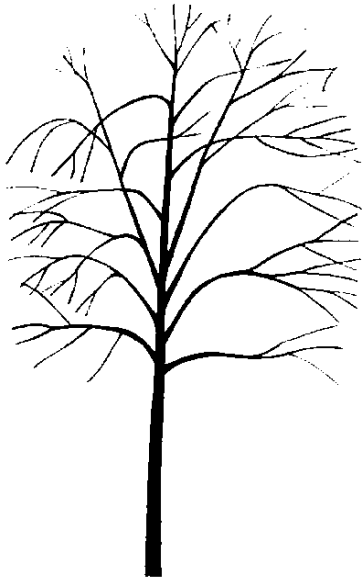
**Shape:** round, oval

**Other:** easier to transplant than some oaks, russet red to red fall color

**Cultivars:**

**Additional:** transplant in spring

---



**Scientific name:** *Robinia pseudoacacia*

**Common name:** Blacklocust

**Environmental characteristics:**

**Zone:** 4b - 9a

**Wet/dry:** tolerates intermittent flooding and drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** good in very difficult reclamation sites, fixes own nitrogen

**Insect/Disease factors:** borers can be a serious problem, leaf miners may also be problematic

**Ornamental characteristics:**

**Height:** 40' - 70'

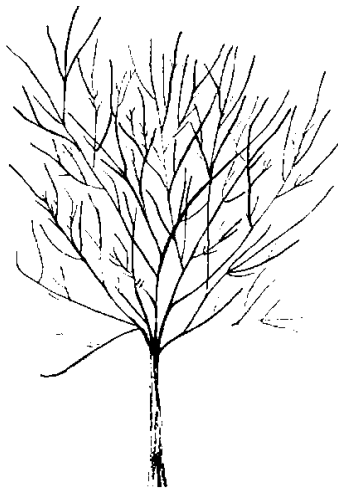
**Shape:** open irregular

**Other:** white, fragrant flowers in late spring, dark gray rosy bark

**Cultivars:** 'Bessoniana' (small, compact, well branched, oval, spineless), 'Globe' (small, spineless), 'Pyramidalis' (narrow, spineless)

**Additional:** widely used in Europe as a street tree, transplant in spring or fall

---



**Scientific name:** *Sorbus alnifolia*

**Common name:** Korean Mountain Ash

**Environmental characteristics:**

**Zone:** 4b - 7b

**Wet/dry:** requires moist, well drained soils

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** susceptible to fireblight

**Ornamental characteristics:**

**Height:** 40' - 50'

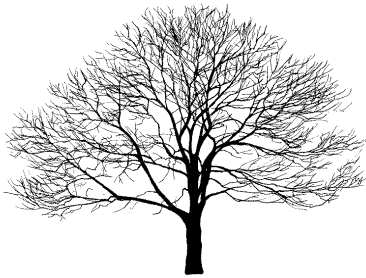
**Shape:** pyramidal-round

**Other:** attractive flowers and persistent red-orange fruit, orange-red fall color

**Cultivars:**

**Additional:** transplant in spring or fall.

---



*Styphnolobium japonicum*  
'Regent'

**Scientific name:** *Styphnolobium japonicum* (*Sophora japonica*)

**Common name:** Scholar Tree

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates drought

**Salt:** tolerant

**pH:** 5.0 - 8.2

**Other:** fixes own nitrogen.

**Insect/Disease factors:** 'Regent' resistant to leafhoppers, twig dieback and stem canker in colder zones

**Ornamental characteristics:**

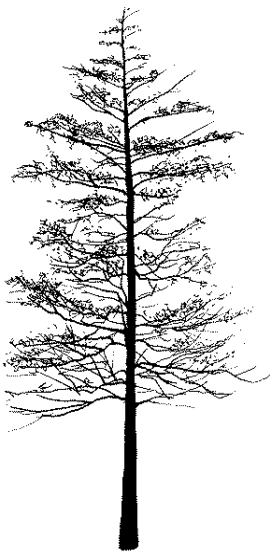
**Height:** 50' - 70'

**Shape:** dense, round

**Other:** attractive cream colored flowers in late July

**Cultivars:** 'Princeton Upright' (upright), 'Regent' (rapid growth, profuse flowering, resistant to leaf-chewers)

**Additional:** transplant in spring or fall, somewhat weak wooded



**Scientific name:** *Taxodium distichum*

**Common name:** Baldcypress

**Environmental characteristics:**

**Zone:** 5a - 9a

**Wet/dry:** tolerates wet soils, intermittent flooding and moderate drought once established

**Salt:** moderate tolerance

**pH:** 5.0 - 7.4

**Other:**

**Insect/Disease factors:** generally free of problems

**Ornamental characteristics:**

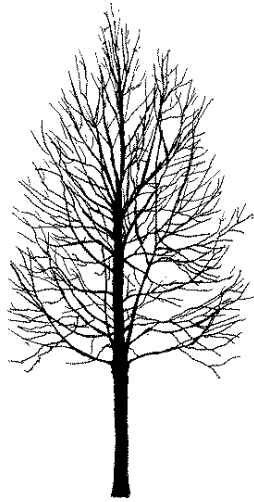
**Height:** 50' - 70'

**Shape:** columnar when young wide spreading, open with age

**Other:** late to leaf out

**Cultivars:** 'Shawnee Brave' (narrower, reportedly tolerates high pH soils. zone 5b)

**Additional:** transplant in spring, slow to recover from transplanting



**Scientific name:** *Tilia americana*

**Common name:** Basswood

**Environmental characteristics:**

**Zone:** 3a - 8a

**Wet/dry:** requires moist, well drained sites but will tolerate intermittent drought once established

**Salt:** sensitive

**pH:** 6.5 - 8.2

**Other:**

**Insect/Disease factors:** very susceptible to Japanese beetles, mites, aphids, borers, leaf miners & scale may also be problematic

**Ornamental characteristics:**

**Height:** 60' - 80'

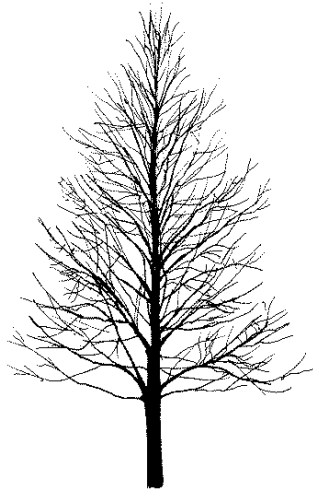
**Shape:** pyramidal

**Other:** fragrant flowers in June

**Cultivars:** 'Redmond' (pyramidal)

**Additional:** transplant in spring or fall

---



*T. cordata* 'Glenleven'

**Scientific name:** *Tilia cordata*

**Common name:** Littleleaf Linden

**Environmental characteristics:**

**Zone:** 3b - 8a

**Wet/dry:** requires moist, well-drained soils, intolerant of poor drainage, will tolerate intermittent drought once established but prolonged drought will lead to leaf scorch.

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:** tolerates moderate compaction

**Insect/Disease factors:** highly susceptible to aphids and Japanese beetles especially 'Greenspire'

**Ornamental characteristics:**

**Height:** 60' - 80'

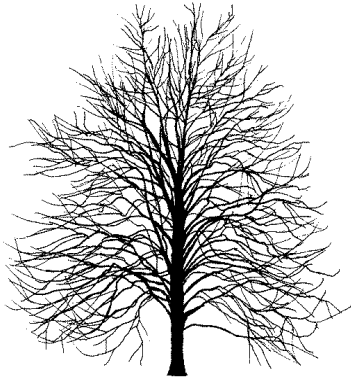
**Shape:** dense, pyramidal

**Other:** fragrant flowers in June

**Cultivars:** many good cultivars including 'Chancellor' (narrower, fast growing), 'Glenleven' (broad columnar, very cold hardy), 'Greenspire' (pyramidal, readily available), 'Rancho' (upright, vigorous, partially resistant to Japanese beetle)

**Additional:** transplant in spring or fall

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**Scientific name:** *Tilia euchlora*

**Common name:** Crimean Linden

**Environmental characteristics:**

**Zone:** 5a - 8a

**Wet/dry:** tolerates intermittent drought, but best on moist, well drained sites

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:** reported more drought resistant than *T. cordata*.

**Insect/Disease factors:** more resistant to aphids than *T. cordata*

**Ornamental characteristics:**

**Height:** 50'

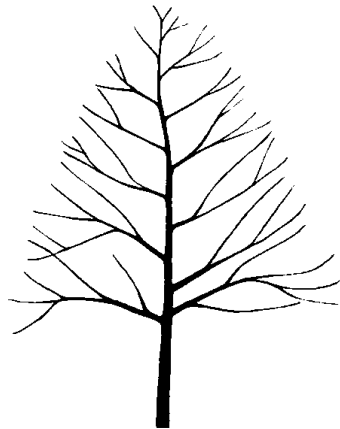
**Shape:** round

**Other:** vigorous compact growth. basal suckering on grafted trees

**Cultivars:** 'Laurelhurst' (compact, pyramidal, straight trunk)

**Additional:** transplant in spring or fall

---



*T. tomentosa* 'Sterling Silver'

**Scientific name:** *Tilia tomentosa*

**Common name:** Silver Linden

**Environmental characteristics:**

**Zone:** 5a - 8a

**Wet/dry:** tolerates moderate drought

**Salt:** sensitive

**pH:** 5.0 - 8.2

**Other:** tolerates drought and heat better than *T. cordata*

**Insect/Disease factors:** less susceptible to Japanese beetles than other lindens

**Ornamental characteristics:**

**Height:** 60' - 80'

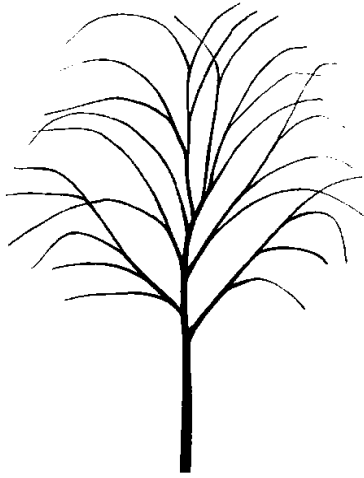
**Shape:** pyramidal

**Other:** fragrant flowers, attractive white pubescence on underside of leaves

**Cultivars:** 'Sterling Silver' (vigorous grower, resistant to Japanese beetles), 'Green Mountain' (symmetrical, dense canopy)

**Additional:** transplant in spring, slower to recover from transplanting than other lindens

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*Ulmus* 'Homestead'

**Scientific name:** *Ulmus spp.*

**Common name:** Elm Hybrids

**Environmental characteristics:**

**Zone:** various

**Wet/dry:** tolerates intermittent flooding and drought once established

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** cultivars reportedly resistant to Dutch Elm Disease: 'Delaware #2', 'Homestead', 'Pioneer', 'Sapporo Autumn Gold', 'Urban', 'Washington', cultivars resistant to elm yellows: 'Homestead', 'Pioneer', 'Sapporo Autumn Gold', 'Urban'

**Ornamental characteristics:**

**Height:** 40' - 50'

**Shape:** upright, vase

**Other:**

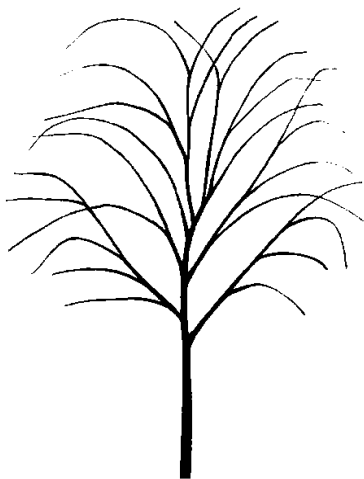
**Cultivars:**

**Zone 3b:** 'Delaware #2' (vigorous, broad crown), 'Washington'

**Zone 4:** 'Patriot', 'Prospector'

**Zone 5a:** 'Frontier' 'Homestead' (symmetrical), 'Pioneer' (rapid grower, good fall color), 'Sapporo Autumn Gold' (upright vase, golden yellow fall color), 'Urban' (tolerant of drought, soil compaction, restricted root space)

**Additional:** new group of cultivars with good resistance to Dutch Elm disease, elm leaf beetle and elm yellows available for testing include: 'Frontier', 'New Harmony' 'Patriot', 'Prospector', 'Valley Forge', transplant in spring



*U. parvifolia* 'Dynasty'

**Scientific name:** *Ulmus parvifolia*

**Common name:** Chinese Elm

**Environmental characteristics:**

**Zone:** 5b - 9a

**Wet/dry:** tolerates drought

**Salt:**

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:** resistant to Dutch Elm disease, elm yellows and other insect problems

**Ornamental characteristics:**

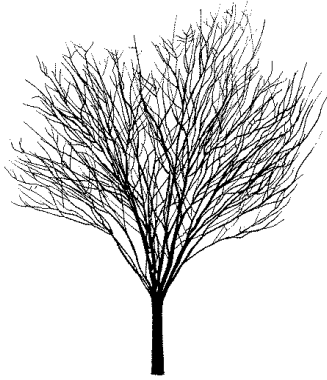
**Height:** 40' - 75'

**Shape:** round, vase

**Other:**

**Cultivars:**

**Additional:** new group of cultivars with good resistance to Dutch Elm disease, elm leaf beetle and elm yellows available for testing include: 'Ohio', 'Dynasty', 'Emerald Isle', 'Emerald Vase', 'King's Choice', Pathfinder. transplant in spring or fall



*Z. serrata* 'Green Vase'

**Scientific name:** *Zelkova serrata*

**Common name:** Japanese Zelkova

**Environmental characteristics:** needs full sun

**Zone:** 5b - 9a

**Wet/dry:** drought tolerant once established

**Salt:** moderate

**pH:** 5.0 - 8.2

**Other:**

**Insect/Disease factors:**

**Ornamental characteristics:**

**Height:** 60' - 80'

**Shape:** vase

**Other:** narrow crotch angles and poor branch attachment can give rise to splitting and form damage when older

**Cultivars:** 'Green Vase' (upright vase, fast grower, golden-orange fall color), 'Halka' (upright vase, most elm like, better branch attachment, yellow fall color), 'Village Green' (vase, shorter than other cultivars, fast grower, rusty red fall color)

**Additional:** transplant in spring

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# TREES FOR VARIOUS SITE CONDITIONS

## MOISTURE:

<b>Tolerates Poorly Drained or Intermittently Flooded Soils:</b>	
<i>Acer x freemanii</i>	Freeman Maple
<i>Acer rubrum</i>	Red Maple
<i>Alnus glutinosa</i>	Black Alder
<i>Betula nigra</i>	River Birch
<i>Fraxinus americana</i>	American Ash
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Maclura pomifera inermis</i>	Osage Orange
<i>Nyssa sylvatica</i>	Tupelo
<i>Platanus x acerifolia</i>	London Planetree
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus macrocarpa</i>	Bur Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus phellos</i>	Willow Oak
<i>Robinia pseudoacacia</i>	Blacklocust
<i>Taxodium distichum</i>	Baldcypress
<b>Requires Moist but Well Drained Soils:</b>	
<i>Aesculus x carnea</i>	Red Horse Chestnut
<i>Amelanchier spp.</i>	Serviceberry
<i>Cercidiphyllum japonicum</i>	Katsura Tree
<i>Liriodendron tulipifera</i>	Tulip Tree
<i>Metasequoia glyptostroboides</i>	Dawn Redwood
<i>Phellodendron amurense</i>	Amur Corktree
<i>Sorbus alnifolia</i>	Korean Mountain Ash
<b>Tolerates Moderate Drought:</b>	
<i>Acer truncatum</i>	Shantung Maple
<i>Acer x freemanii</i>	Freeman Maple
<i>Carpinus betulus</i>	European Hornbeam
<i>Carpinus caroliniana</i>	American Hornbeam
<i>Celtis laevigata</i>	Sugar Hackberry
<i>Corylus colurna</i>	Turkish filbert
<i>Ostrya virginiana</i>	American Hophornbeam
<i>Platanus x acerifolia</i>	London Planetree
<i>Quercus acutissima</i>	Sawtooth Oak

<i>Quercus palustris</i>	Pin Oak
<i>Quercus robur</i>	English Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Quercus imbricaria</i>	Shingle Oak
<i>Quercus muehlenbergii</i>	Yellow Chestnut Oak
<i>Tilia americana</i> 'Redmond'	Redmond Basswood
<i>Tilia cordata</i>	Littleleaf Linden
<i>Tilia euchlora</i>	Crimean Linden
<i>Tilia tomentosa</i>	Silver Linden

**Tolerates More Severe Drought:**

<i>Acer campestre</i>	Hedge Maple
<i>Celtis occidentalis</i>	Hackberry
<i>Crataegus spp.</i>	Hawthorn
<i>Eucommia ulmoides</i>	Hardy Rubber Tree
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Ginkgo biloba</i>	Ginkgo
<i>Gleditsia triacanthos inermis</i>	Honeylocust
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree
<i>Koelreuteria paniculata</i>	Goldenraintree
<i>Maclura pomifera inermis</i>	Osage Orange
<i>Malus spp.</i>	Crabapple
<i>Quercus macrocarpa</i>	Bur Oak
<i>Robinia pseudoacacia</i>	Blacklocust
<i>Styphnolobium japonicum (Sophora japonica)</i>	Scholar Tree
<i>Sorbus intermedia</i>	Swedish Mountain Ash
<i>Syringa reticulata</i>	Japanese Tree Lilac
<i>Ulmus parvifolia</i>	Chinese Elm
<i>Zelkova serrata</i>	Japanese Zelkova

**pH**

**Requires Acid Soil pH 5.0 - 7.0**

<i>Acer buergeranum</i>	Trident Maple
<i>Acer rubrum</i>	Red Maple
<i>Betula nigra</i>	River Birch
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus phellos</i>	Willow Oak

**Can Tolerate Acid to Neutral Soil pH 5.0 - 7.4**

<i>Acer x freemanii</i>	Freeman Maple
<i>Alnus glutinosa</i>	Black Alder
<i>Amelanchier spp.</i>	Serviceberry
<i>Liquidambar styraciflua</i>	Sweet Gum
<i>Metasequoia glyptostroboides</i>	Dawn Redwood
<i>Nyssa sylvatica</i>	Tupelo
<i>Prunus 'Accolade'</i>	Accolade Flowering Chery
<i>Prunus sargentii</i>	Sargent Cherry
<i>Quercus acutissima</i>	Sawtooth Oak
<i>Quercus imbricaria</i>	Shingle Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Taxodium distichum</i>	Baldcypress

**Can Tolerate Acid to Alkaline Soil pH 5.0-8.0**

<i>Acer campestre</i>	Hedge Maple
<i>Acer pseudoplatanus</i>	Sycamore Maple
<i>Acer truncatum</i>	Shantung Maple
<i>Acer platanoides</i>	Norway Maple
<i>Aesculus x carnea</i>	Red Horse Chestnut
<i>Carpinus betulus</i>	European Hornbeam
<i>Carpinus caroliniana</i>	American Hornbeam
<i>Celtis laevigata</i>	Sugar Hackberry
<i>Celtis occidentalis</i>	Hackberry
<i>Cercidiphyllum japonicum</i>	Katsura Tree
<i>Cladrastis kentukea</i>	Yellowwood
<i>Corylus colurna</i>	Turkish Filbert
<i>Crataegus phaenopyrum</i>	Washington Hawthorn
<i>Crataegus crus-galli inermis</i>	Hawthorn
<i>Crataegus viridis 'Winter King'</i>	Winter King Hawthorn
<i>Eucommia ulmoides</i>	Hardy Rubber Tree
<i>Fraxinus americana</i>	White Ash
<i>Fraxinus excelsior</i>	European Ash
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Ginkgo biloba</i>	Ginkgo
<i>Gleditsia triacanthos inermis</i>	Honeylocust
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree
<i>Koelreuteria paniculata</i>	Goldenraintree
<i>Maclura pomifera inermis</i>	Osage Orange
<i>Malus spp.</i>	Crabapple
<i>Ostrya virginiana</i>	American Hophornbeam

<i>Phellodendron amurense</i>	Amur Corktree
<i>Platanus x acerifolia</i>	London Planetree
<i>Pyrus calleryana</i>	Callery Pear
<i>Quercus macrocarpa</i>	Bur Oak
<i>Quercus muehlenbergii</i>	Yellow Chestnut Oak
<i>Quercus robur</i>	English Oak
<i>Robinia pseudoacacia</i>	Blacklocust
<i>Sorbus alnifolia</i>	Korean Mountain Ash
<i>Sorbus intermedia</i>	Swedish Mountain Ash
<i>Sorbus thuringiaca fastigiata</i>	Columnar Oakleaf Mountain Ash
<i>Styphnolobium japonicum (Sophora japonica)</i>	Scholar Tree
<i>Syringa reticulata</i>	Japanese Tree Lilac
<i>Tilia americana 'Redmond'</i>	Redmond Basswood
<i>Tilia cordata</i>	Littleleaf Linden
<i>Tilia euchlora</i>	Crimean Linden
<i>Tilia tomentosa</i>	Silver Linden
<i>Ulmus parvifolia</i>	Chinese Elm
<i>Ulmus spp.</i>	Elm
<i>Zelkova serrata</i>	Japanese Zelkova

## SALT TOLERANCE:

<b>Tolerates Salt:</b>	
<i>Acer buergeranum</i>	Trident Maple
<i>Acer campestre</i>	Hedge Maple
<i>Acer pseudoplatanus</i>	Sycamore Maple
<i>Acer platanoides</i>	Norway Maple
<i>Alnus glutinosa</i>	Black Alder
<i>Crataegus spp.</i>	Hawthorne
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Ginkgo biloba</i>	Ginkgo
<i>Gleditsia triacanthos inermis</i>	Honeylocust
<i>Koelreuteria paniculata</i>	Goldenraintree
<i>Maclura pomifera</i>	Osage Orange
<i>Platanus x acerifolia</i>	London Planetree
<i>Prunus sargentii</i>	Sargent Cherry
<i>Pyrus calleryana</i>	Callery Pear
<i>Quercus robur</i>	English Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Robinia pseudoacacia</i>	Blacklocust
<i>Styphnolobium japonicum (Sophora japonica)</i>	Scholar Tree
<i>Taxodium distichum</i>	Baldcypress

<b>Sensitive to Salt:</b>	
<i>Acer rubrum</i>	Red Maple
<i>Carpinus betulus</i>	European Hornbeam
<i>Liriodendron tulipifera</i>	Tulip Tree
<i>Ostrya virginiana</i>	Hophornbeam
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus palustris</i>	Pin Oak
<i>Tilia americana</i> 'Redmond'	Redmond Basswood
<i>Tilia cordata</i>	Littleleaf Linden
<i>Tilia euchlora</i>	Crimean Linden

# TRANSPLANTING GUIDE

## Planting guide covers:

- Selecting high-quality nursery plants
- Transporting, storing, and handling plants
- Transplanting ball and burlap, container and bare root plants
- Post-planting maintenance

## Selecting high-quality nursery plants

The goal in selecting nursery plants is to purchase those plants most likely to become successfully established and to mature in the landscape in order to meet design expectations with a minimum of maintenance. To do that, choose plants with good root systems and healthy, well-formed and undamaged crowns and trunks. In addition, any plant that you purchase should have a professional pedigree: grown in a nursery, dug and prepared for shipping by trained workers, and maintained properly while awaiting purchase. That is, buy plants from nurseries with good reputations and whose people you trust. Chances are that plants from reputable nurseries will have been treated properly and will establish reliably.

There are specific characteristics to look for (and look out for) when selecting nursery plants.

### Trunk and Branch Characteristics

1. Buy plants that have a form typical of the species.
2. Shoots should show good vigor and growth.
3. Branches should be well-spaced and have good branch attachment. Avoid narrow branch attachments that may have included bark.
4. Crowns should be reasonably free of wounds and/or evidence of insect damage and/or disease.
5. Avoid top-heavy trees and plants that have been severely headed back.
6. Trunks should be straight, free from wounds or diseases and show trunk flare and proper trunk taper.

### Foliage Characteristics

1. Foliage should have good color, with no sign of insect pests and/or diseases.
2. There should be an adequate number and size of leaves.
3. Avoid plants with leaf margins that are scorched. It is a sign of water stress.

### Root and Rootball Characteristics

1. All plants should have an adequate-sized rootball as specified by the *American Standard for Nursery Stock*.
2. Roots should have a good connection with the shoots—if you gently rock the plant, the entire rootball should move.
3. Ball and burlap rootballs should be covered with natural burlap.
4. Container plants should not be pot-bound and, if you gently remove a plant from its pot, you should see healthy whitish root tips.
5. Avoid plants with kinked root systems. It is hard to determine if a plant has a kinked root, but if you see one, do not buy that plant.
6. Avoid plants with weedy rootballs.

## **Handling, transporting and storing nursery plants**

The objective in handling, transporting and storing nursery plants is to minimize water stress and ensure a good connection between the roots and the shoots. To minimize water stress, use techniques in handling, transporting and storing plants that reduce transpirational stress while providing enough water to meet plant requirements. The following are recommended techniques for nursery plants (the most important recommendations appear in boldface type).

### Handling

1. **Always carry the plant by the rootball**, never solely by the trunk or branches.
2. Keep any wrap or other protection on the plant when handling, transporting or storing.
3. Avoid dropping or crushing the rootball.
4. Pad the edges of machinery that handles plants to avoid wounding.
5. Tie up branches with a gentle hand. They can easily crack or break.

### Transporting

1. **Tarp all plants in transit**, preferably with a breathable mesh covering.
2. Rootballs should be moist before transporting.
3. Plants should be placed in truck so there is a minimum of shifting and movement while in transit.
4. If possible, support trunks.

### Storing Plants at the Jobsite or Holding Yard

1. **Make sure plants are well watered.** Daily or even more frequent irrigation may be needed during summer months.
2. Store plants in a shady location.
3. Group plants together.
4. Heel plants into mulch or soil if they are to be stored for a long time.

## **Transplanting ball and burlap, container and bare root plants**

The goal in transplanting is to make every effort to allow the plant to become established quickly by encouraging the swift regeneration and regrowth of the root system. To do this, the planting hole should be wide and shallow (mimicking the shape of the plant's root system), backfilled appropriately, and the tree or shrub planted at the proper depth. The decision on whether or not to amend the backfill with organic material depends on the soil texture and drainage characteristics of the site.

### The Planting Hole

1. **Dig the planting hole 2 - 3 times the diameter (width) of the rootball and no deeper than the depth of the rootball.**
2. Loosening or tilling the entire landscape bed is preferred over digging individual planting holes.
3. Avoid planting when the soil is very moist because wet soil has a tendency to glaze and become compacted.

## Amendments

Whether or not to add organic amendments to the backfill depends on the soil type and how well it drains.

*Sandy, excessively drained soil:* Organic amendments help hold needed water and nutrients; add 30 - 40 % by volume of organic material to the backfill.

*Intermediate (loamy), well to adequately drained soil:* Amendments will probably do little to help the plant. It's better to use native backfill only.

*Clayey, poorly drained soil:* **Do not** amend clayey or poorly drained soil. It may lead to waterlogged soil and plant death; instead, loosen soil in a wide area and use native backfill only.

## Removing Rootball Coverings

In general, rootball coverings that will impede root growth should be removed. Not all materials that look like natural burlap (which degrades slowly, but surely) are natural burlap, and may not degrade much, if at all. Depending on what type of burlap was used, you will have to be more or less vigorous in your efforts to remove it before planting.

*Natural burlap* Remove excess burlap from around rootball and any burlap that has been wrapped around the trunk. Be sure that there will be good soil contact between the rootball and the backfill.

*Synthetic burlap, treated burlap, carpet backing, synthetic/natural blend* It is best to remove the burlap—but be careful to keep the rootball intact. If you do not think you can pull all the burlap away from the plant without the rootball remaining intact, cut away as much as possible.

*Natural and synthetic twine* Remove all twine that is wrapped around the trunk of the tree or shrub.

*Wire baskets* Use this two-step approach to remove wire baskets without jeopardizing the rootball:

1. before the plant is placed in the hole, cut away the bottom few “rungs” of the basket
2. place the plant in the hole, using the remaining part of the basket to move and face the plant, backfill up to the wire, then remove the remaining wire. In this way, the wire basket is removed only when the plant is stable in the planting hole.

*Container plants* If the plant is not pot bound, tease out the roots with your fingers. If the plant is pot bound, make four 1" slices with a knife, spade or trowel down the sides of the pot and also slice the bottom of the rootball. Tease out roots with your fingers.

## Placing the Tree in the Hole and Backfilling

1. Place the plant in the hole by handling the rootball only. Face and plumb the plant appropriately.
2. **Plant tree at the proper depth**—The rootball should be set so that the trunk flare is exactly at the existing grade in loamy or sandy soils, and above the existing grade in clayey or poorly drained soils (up to 1/3rd of the ball can be above the existing grade). Make sure that you have uncovered the trunk flare. Soil can be added inadvertently covering the flare during digging at the nursery.

3. Backfill firmly, but without overly compacting the soil. Try to eliminate air pockets. Some landscapers partially backfill the hole, irrigate, then allow the water to fully drain before completing the backfilling. This helps eliminate air pockets.
4. Do not cover the trunk with soil; the backfill should come right up to the rootball, but little, if any soil should cover the rootball.
5. If you wish, form a 2 - 3" soil rim at the edge of the planting hole. The rim helps hold in water and direct it to the roots, but be sure to remove the rim within two years (roots should be beyond the planting hole by then).
6. There is no need to fertilize the tree or shrub at planting. If you feel you must fertilize—go lightly! Incorporate no more than 1 - 2 pounds of slow-release nitrogen per 1000 square feet in the backfill. Too much fertilizer will burn the roots.
7. Avoid planting when the soil is very moist. It is difficult to work the soil, and the risk of glazing and compacting the soil is great.

### Completing the Planting

1. Create a mulch ring using a layer of 2 - 3" of mulch. Do not over-apply mulch, and keep it away from the trunk.
2. Water the tree in well. Irrigating supplies needed water, helps to remove air pockets and improves soil contact with the rootball.
3. Prune to remove dead, diseased, damaged, crossing branches and competing leaders.
4. Stake and wrap the tree only if necessary. Know that any material you use on a tree must be removed within a year to prevent girdling. If you must stake, stake so the tree can move in the wind and use materials that minimize rubbing.

### Maintenance in the First Growing Season

1. Irrigate the plants as frequently as is necessary to keep rootball moist, but not too wet. As a rule of thumb, start with two waterings per week for the first few months, then drop to once a week through the rest of the growing season. When you water, water well.
2. Maintain the 2 - 3" mulch layer. Keep weeds to a minimum.
3. Use fertilizer only if you have determined, by visual inspection of growth and/or by a nutrient analysis test, that the plant requires additional nutrients. Usually, nitrogen is the only deficient nutrient. If you choose to fertilize, broadcast 1-2 pounds of nitrogen per 1000 square feet per year of a slow release fertilizer before budbreak.
4. After the first growing season, evaluate the structure of the plant and do any necessary structural pruning.

### Planting in Poorly Drained Soils

Most plants cannot live in waterlogged or poorly drained soils. If you must plant in poorly drained soils, be sure that the species you have selected tolerate wet soil. In addition to planting high, you may need to take additional steps to improve drainage within the planting hole.

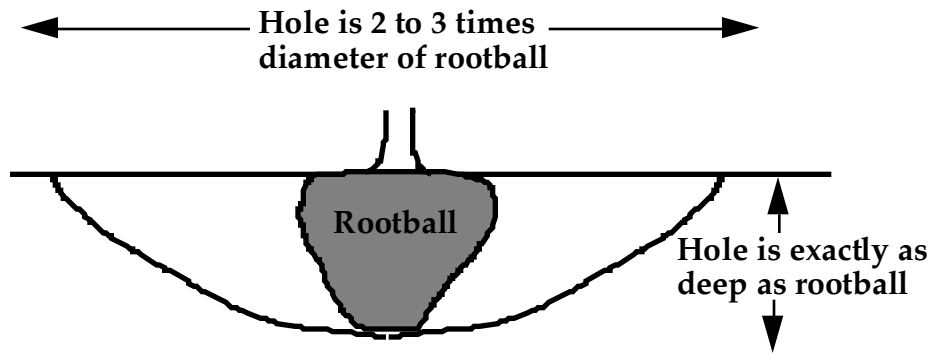
1. Plant high as described for clayey soils. The mound that is created by planting high reduces the amount of water that enters the planting hole—water simply runs off the mound and away from the rootball.
2. Place the rootball on a pedestal of undisturbed soil so that excess water can pool below the rootball before the water slowly moves further down the soil profile.
3. Install a sump at the bottom of the planting hole that acts as a reservoir for excess water. A sump is made by using a post-hole digger to dig a 2 - 3' deep hole at the bottom of the planting hole, but as near to the rootball as possible. Place an ADS slotted plastic pipe in the hole and fill the pipe with gravel. Cover the top of the pipe with geotextile fabric.

## **Planting Bare Root Trees**

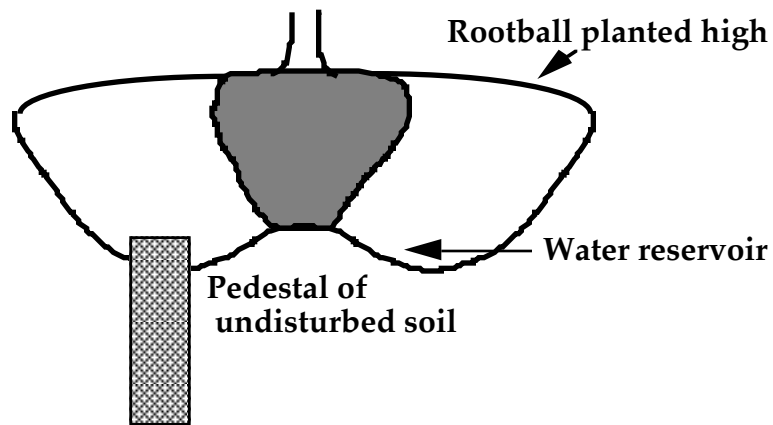
Bare root trees are handled and planted in much the same manner as balled and burlapped and container plants. The planting hole is dug 2 - 3 times the width of the root mass, and dug only as deep as the roots. The decision to amend or not to amend hinges on soil texture as previously described. There are, however, a few techniques that you can use to increase the success of bare root plantings.

1. Research at Cornell University has shown that dipping the roots of a recently dug bare root tree in a slurry of hydrogel and water aids in transplant success. It is thought that the slurry creates a reservoir of water that helps the roots avoid desiccation. Research is continuing in other effective treatments for bare root trees, and more recommendations should be available in the next few years.
2. If you must store bare root trees for a few days before planting, keep them in a cool, shaded location, and water frequently to prevent the roots from drying out.
3. Soak the tree roots in water overnight immediately before planting to rehydrate them.
4. If root ends appear jagged or split, cut them cleanly with a sterilized pair of pruning shears.
5. When backfilling, be sure that you fill all air spaces with soil—avoid large pockets of air which inhibit root growth.
6. Stake if necessary and water in well.

### Typical Planting Detail

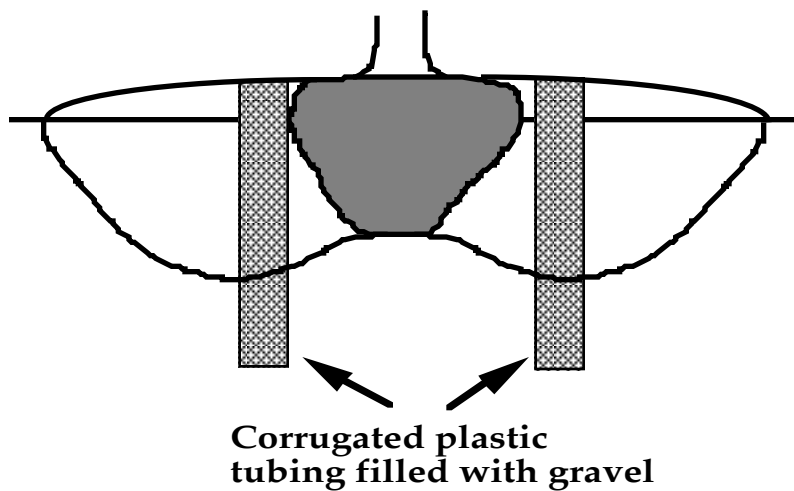


### Planting Detail for Poorly Drained, Clayey Soils



Optional sump made of corrugated plastic tubing filled with gravel

### Detail Showing Installation of Reservoir Sumps--For Very Poorly Drained Soils



# NOTES