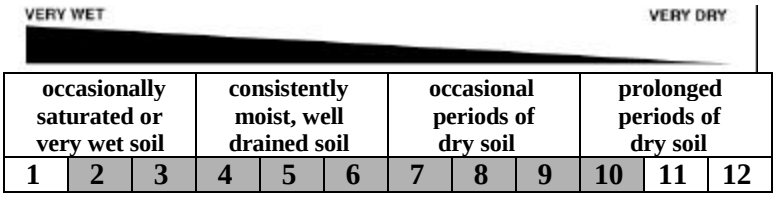
Scientific Name: *Catalpa speciosa*
Common Name: Northern Catalpa
Environmental Conditions:

Hardiness Zone: 4a
Soil Moisture:



Sun/Shade: full sun
Salt: unknown
pH: $\underline{<}$ 8.2

Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 50'-60' typical, can reach over 100'
Width: 20'-40'
Form/Habit: narrow, open, irregular-oval
Rate: medium to fast

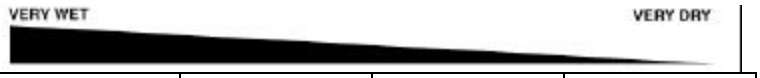
Ornamental Characteristics:

Flower: showy, white, orchid-like with yellow and/or purplish spots inside, large 6" upright clusters, early to mid summer
Fruit: 8"-20" long, thin, pendulous pods, green changing to brown, persistent throughout winter
Seasonal Foliage Color: bright to medium green in summer, poor yellow-green to brownish in fall
Bark: dark grayish brown, old trunks are ridged and furrowed or thick and scaly

Transplant Issues: easy to transplant B&B or $\leq$ 2" caliper bare root
Management Issues: fruit litter could be a nuisance in some areas
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: none known

Scientific Name: *Celtis laevigata*
Common Name: Sugar Hackberry, Southern or Mississippi Hackberry
Environmental Conditions:

Hardiness Zone: 6a (culitvars reportedly zone 5)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: prefers full sun, tolerates partial shade
Salt: unknown
pH: $\leq$ 7.5
Other: good heat and wind tolerance

Insect/Disease Factors: resistant to witches' broom and nipple gall, **'Magnifica'** resistant leafhoppers
Growth Characteristics:

Height: 60'-80'
Width: similar to height, 60'+
Form/Habit: rounded with spreading, often pendulous branches
Rate: medium to fast

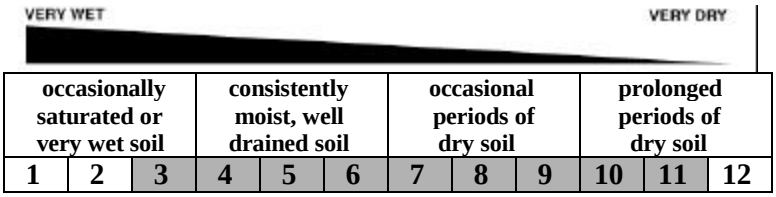
Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous clusters
Fruit: small orange-red to blue-black drupes in fall
Seasonal Foliage Color: light green in summer, dull yellow in fall
Bark: smooth light gray with corky/warty ridges
Other: foliage is smaller than *C. occidentalis*

Transplant Issues: moderately difficult to transplant bare root, better success in transplanting bare root in fall, do not attempt to transplant > 2" caliper trees bare root, best planted B&B, somewhat slow to establish
Management Issues: 'All Seasons' twigs are heavier than average for species and less likely to shed
Suggested Uses: wide street tree lawns/pits due to size, **'All Seasons'** can be used in narrow street tree lawns/pits, parks
Cultivars: 'All seasons' (reportedly zone 5, 40'-50' high, 30'-40' wide, fast growing, well balanced crown with ascending branches, fine textured foliage, good yellow fall color, red fruit, American Beech-like bark is smooth silver-gray with few corky ridges), **'Magnifica'** (*C. occidentalis* and *C. laevigata* hybrid, reportedly zone 5, broadly oval to vase-shaped, fast growing, nearly sterile – little to no fruit)

Scientific Name: *Celtis occidentalis*
Common Name: Common Hackberry
Environmental Conditions:

Hardiness Zone: 3b (3a, 2b)
Soil Moisture:



Sun/Shade: prefers full sun, tolerates partial shade
Salt: unknown
pH: ≤ 8.2
Other: good heat and wind tolerance

Insect/Disease Factors: susceptible to various problems, although most rarely serious or limiting, except witches' broom, which can disfigure form with abnormal branch growth (broom-like clusters)
Growth Characteristics:

Height: 40'-60'
Width: similar to height, 40'+
Form/Habit: pyramidal when young, irregular-rounded when mature, open branching, somewhat elm-like with ascending then arching branches
Rate: medium to fast

Ornamental Characteristics:

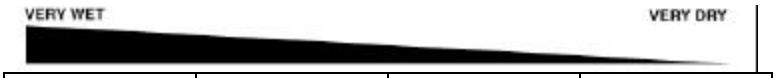
Flower: not ornamentally important, inconspicuous clusters, spring as leaves are emerging
Fruit: yellow or orange-red to dark purple drupe, fall
Seasonal Foliage Color: light to medium green in summer, yellow in fall
Bark: gray with rough and corky ridges

Transplant Issues: moderately difficult to transplant bare root, better success in transplanting bare root in fall, do not attempt to transplant > 2" caliper trees bare root, best planted B&B, somewhat slow to establish
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: 'Prairie Pride' (zone 3b or 4, rapid grower, compact uniform crown, thick leathery lustrous foliage, dark red-purple fruit, lighter fruit crop than species)

Scientific Name: *Cercidiphyllum japonicum*
Common Name: Katsura Tree
Environmental Conditions:

Hardiness Zone: 5a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: prefers full sun, tolerates partial shade
Salt: unknown
pH: ≤ 8.2
Other: protected site best

Insect/Disease Factors: relatively pest free, resistant to *Verticillium* Wilt

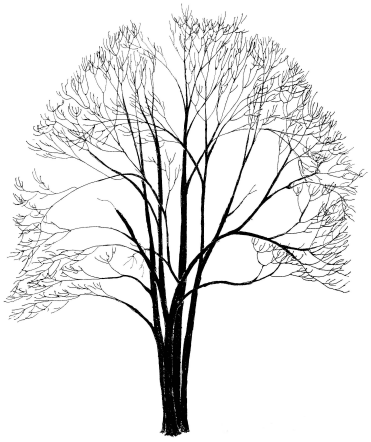
Growth Characteristics:

Height: 40'-60' (can reach 100' in the wild)
Width: quite variable, 25'-60'
Form/Habit: upright pyramidal when young, round with age, multi-stem or single-stem forms available
Rate: medium to fast

Ornamental Characteristics:

Flower: early spring before leaves emerge
Fruit: small ½"- ¾" pods in clusters (resemble tiny banana bunches)
Seasonal Foliage Color: new leaves emerge bright red-purple, becoming bluish-green in summer, good yellow to apricot-orange in fall
Bark: attractive, shaggy brown
Other: yellow leaves in fall have a cotton-candy scent

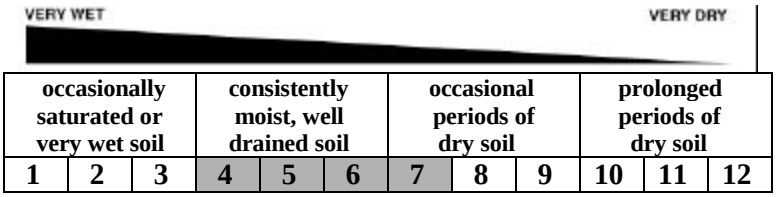
Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: trunk sunscalds easily when young
Suggested Uses: wide street tree lawns/pits and parks due to size and drought sensitivity
Cultivars: weeping forms (**f. *pendula*** and **f. *pendula* 'Morioka Weeping'**) available but not suitable for street tree use



Scientific Name: *Cladrastis kentukea*
Common Name: Yellowwood
Environmental Conditions:

Hardiness Zone: 4b

Soil Moisture:



Sun/Shade: full sun

Salt: unknown

pH: ≤ 8.2

Insect/Disease Factors: relatively pest free

Growth Characteristics:

Height: 30'-50'

Width: 40'-55'

Form/Habit: broadly rounded, graceful arching habit, branches low and typically looses central leader, may need to specify single-stem for street tree use due to multi-stemmed potential

Rate: medium-fast

Ornamental Characteristics:

Flower: showy, fragrant, white, 8"-14" long pendulous clusters, late spring (bi-annually)

Fruit: brown, 3" long seed pods, ripening in fall

Seasonal Foliage Color: bright green in summer, yellow in fall

Bark: attractive smooth gray

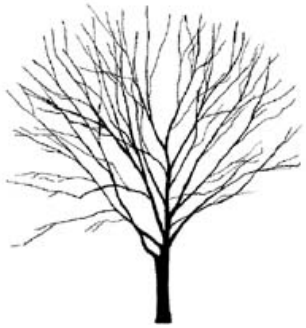
Other: yellow leaf axis (rachises) persist after leaflets fall off in fall, prolonging seasonal interest

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root

Management Issues: prune only in summer as profuse bleeding will occur other times of the year, can be weak wooded with poor crotch angles that split out as the tree grows older, pruning may be needed in youth to develop desired trunk form or for use as a street tree, thin bark sensitive to mechanical damage

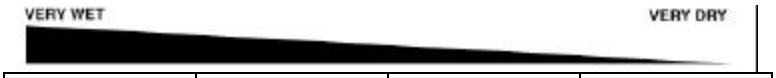
Suggested Uses: wide street tree lawns/pits, narrow tree lawns/pits with pruning, parks

Cultivars: 'Rosea' (sometimes called **'Perkins Pink'**) a pink flowering form, may be difficult to find



Scientific Name: *Corylus colurna*
Common Name: Turkish Filbert
Environmental Conditions:

Hardiness Zone: 5a (4b)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2
Other: heat tolerant once established

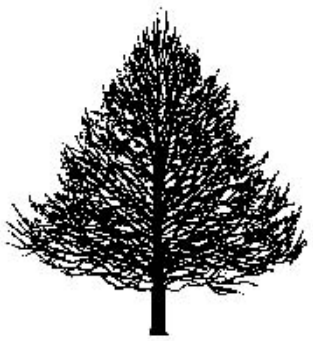
Insect/Disease Factors: occasionally eastern filbert blight can be a serious problem in some areas, leaves fairly resistant to leaf scorch
Growth Characteristics:

Height: 40'-60'
Width: 20'-40'
Form/Habit: broadly pyramidal, conical
Rate: medium

Ornamental Characteristics:

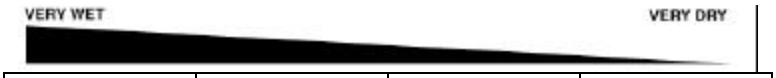
Flower: 2"-3" long, pendulous male catkins, late winter to early spring, female flowers inconspicuous
Fruit: edible nuts inside textured and fringed 2" husks
Seasonal Foliage Color: dark green and leathery in summer (although species variable), potentially yellow to purple in fall, often leaves drop yellow-green
Bark: gray-brown, flakes and scales with age on trunk and older branches, exposing orange-brown inner bark

Transplant Issues: difficult to transplant bare root, best planted B&B
Management Issues: fruit may be a litter problem
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: none available



Scientific Name: *Eucommia ulmoides*
Common Name: Hardy Rubber Tree
Environmental Conditions:

Hardiness Zone: 5b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: $\leq$ 8.2
Other: heat tolerant

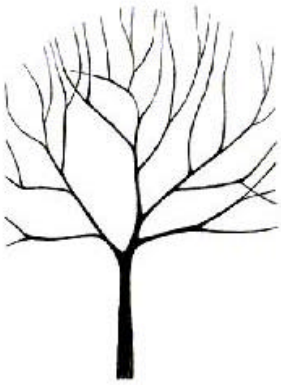
Insect/Disease Factors: relatively pest free
Growth Characteristics:

Height: 40'-60'
Width: 40'-60'
Form/Habit: very sparsely branched in youth, rounded to broad-spreading at maturity
Rate: medium

Ornamental Characteristics:

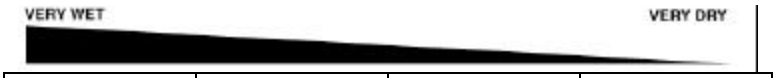
Flower: not ornamentally important
Fruit: 1 ½" winged capsule on female trees
Seasonal Foliage Color: attractive glossy dark green in summer, fall color often nonexistent or poor yellow-green
Bark: gray-brown, becomes ridged and furrowed with age

Transplant Issues: easy to transplant B&B
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: none available



Scientific Name: *Fraxinus americana*
Common Name: White Ash
Environmental Conditions:

Hardiness Zone: 4a (some cultivars to 3)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 8.2

Insect/Disease Factors: Ashes are susceptible to a number of insect and disease problems, ash borer (in hot dry environments) and ash yellows (in the Eastern and Midwestern United States) may be the most serious

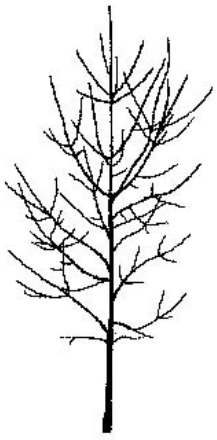
Growth Characteristics:

Height: 50'-70'
Width: 40'-60'
Form/Habit: oval to rounded and open with age, maintains good central leader in youth
Rate: medium

Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous
Fruit: not ornamentally important, 1"-2" long samara, male seedless cultivars available
Seasonal Foliage Color: dark green in summer, color variable in fall (yellow to purple), certain cultivars selected for good reddish to purple color in fall
Bark: gray to gray-brown, narrow interlacing ridges create diamond shaped furrows

Transplant Issues: easy to transplant B&B or $\leq$ 2" caliper bare root
Management Issues: fruit litter can be a problem in some areas, non-fruiting cultivars available, graft incompatibility problems have been observed on some cultivars
Suggested Uses: narrow or wide street tree lawns/pits, wide street tree lawns/pits preferred for straight species due to tree size, parks, suitable for CU-Structural Soil™
Cultivars: see chart on following page

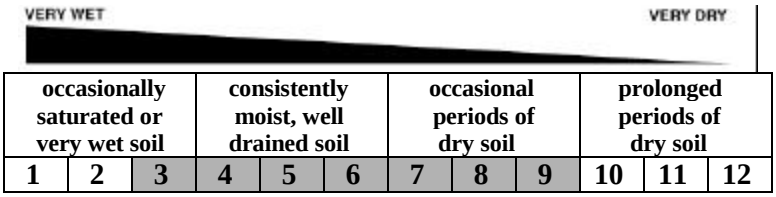


***Fraxinus americana* (White Ash) Cultivars:**

Cultivar	Zone	Form/Habit	Fall Color	Fruiting/ Non-fruiting	Other
'Autumn Applause'	5a	oval, dense branching	maroon, early turning and long lasting	non-fruiting	young trees subject to bark splitting at ground level
'Autumn Blaze'	3	oval	purple	light fruit set	
Autumn Purple® ('Junginger')	5a	round	reddish-purple to deep red	non-fruiting	fast growing, glossy leaves
'Champaign County'	4a (5a)	dense, strong central leader, heavy trunk	not much, yellow to purple possible	little to no fruiting observed	lustrous dark green leaves
'Chicago Regal'	4a	oval to rounded, symmetrical branching	orange to purple, mixed with earth tones	non-fruiting	fast growing, larger foliage, bark resistant to frost cracking
'Empire'	3	narrow oval (25'wide), strong central leader	rusty orange to purple	non-fruiting	
'Rose Hill'	5b	upright oval to pyramidal, sturdy branching	bronze-red to purple	non-fruiting	
'Royal Purple'	4a	oval, upright habit	purple	fruiting	vigorous grower in youth, bark resistant to frost cracking
Skyline® ('Skycole')	4b	oval, strong central leader, symmetrical branching, good branch angles	orange-red	non-fruiting	glossy leaves
Sparzam™ ('Sparticus')	4a	pyramidal form	burgundy with bronze highlights	non-fruiting	glossy dark green foliage, silvery-white undersides, wavy leaf margins, longer foliage retention
Windy City™ ('Tures')	4a	oval to rounded, good central leader, may have smaller width, possibly only 30'-35' wide	burgundy to reddish-orange with orange and yellow highlights	fruiting	semi-glossy foliage, bark resistant to frost cracking

Scientific Name: *Fraxinus excelsior* 'Hessei'
Common Name: Hessei European Ash
Environmental Conditions:

Hardiness Zone: 4b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

Insect/Disease Factors: Ashes are susceptible to a number of insect and disease problems, *F. excelsior* is particularly susceptible to borers, 'Hessei' has shown good pest resistance compared to species and other Ashes, although almost as susceptible to borers as species if planted in a hot dry site

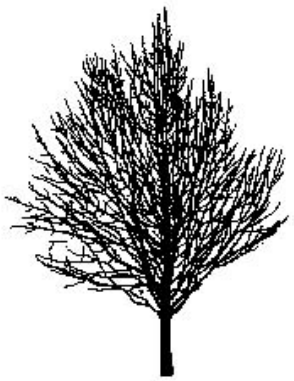
Growth Characteristics:

Height: 60'
Width: 45'
Form/Habit: typically upright oval to rounded, occasionally almost flat-topped at maturity, very vigorous, typically dense
Rate: medium

Ornamental Characteristics:

Flower: not ornamentally important
Fruit: seedless
Seasonal Foliage Color: lustrous dark green in summer, potentially yellow in fall, although leaves typically remain green late into fall and drop when still green
Bark: not ornamentally important, gray to gray-brown

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: above info is cultivar specific



Scientific Name: *Fraxinus* 'Northern Gem' and 'Northern Treasure' (*F. nigra* x *F. mandshurica*)
Common Name: Northern Gem and Northern Treasure Ash
Environmental Conditions:

Hardiness Zone: 3
Soil Moisture:

occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2
Insect/Disease Factors: ash yellows susceptibility unknown
Growth Characteristics:

Height: 50'
Width: 'Northern Gem' 50', 'Northern Treasure' 30'
Form/Habit: 'Northern Gem' is broadly oval, 'Northern Treasure' is upright oval
Rate: moderate to fast

Ornamental Characteristics:

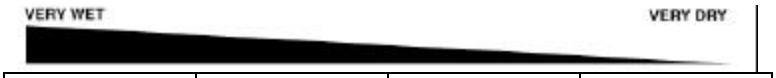
Flower: not ornamentally important, inconspicuous
Fruit: nearly seedless
Seasonal Foliage Color: thick, glossy green in summer, pale orangish-yellow in fall
Bark: not ornamentally important, likely scaly and flaky as *F. nigra*
Other: leaves arch downward

Transplant Issues: available bare root
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: above info is specific to cultivars

Scientific Name: *Fraxinus pennsylvanica*
Common Name: Green Ash
Environmental Conditions:

Hardiness Zone: 2a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun

Salt: some observed tolerance

pH: ≤ 8.2

Insect/Disease Factors: Ashes are susceptible to a number of insect and disease problems, ash borer (in hot dry environments) may be serious, *F. pennsylvanica* is fairly resistant to ash yellows (a problem for *F. americana* in the Eastern and Midwestern United States)

Growth Characteristics:

Height: 40'-60'

Width: 30'-50'

Form/Habit: pyramidal in youth, variable with age, oval to rounded and often irregular

Rate: fast

Ornamental Characteristics:

Flower: not ornamentally important

Fruit: not ornamentally important, samara on female trees

Seasonal Foliage Color: glossy medium to dark green in summer, typically inconsistent yellow in fall, some of available cultivars turn bronze-red, burgundy, or purple in fall

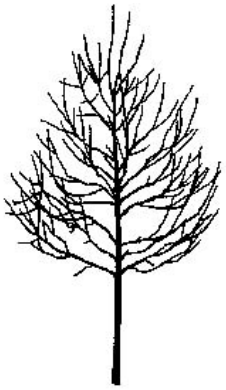
Bark: gray to gray-brown, narrow interlacing ridges create diamond shaped furrows

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root

Management Issues: may require frequent pruning as storm damage prone, fruit litter can be a problem, non-fruiting cultivars available

Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™

Cultivars: see chart on following page, selections made for growth form/habit, seedless character of male trees, and foliage characteristics (specifically dark green and shiny leaves in summer and attractive fall color)



'Patmore'

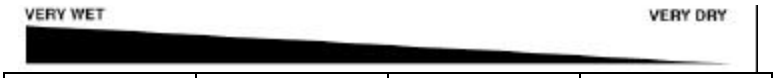
Fraxinus pennsylvanica* (Green Ash) cultivars*:

Common:					
Cultivar	**Zone**	**Form/Habit**	**Foliage**	**Fruit**	**Other**
Cimmaron® (‘Cimmzam’)	4	upright-oval, 30’wide, straight central leader, good branch structure	thick, glossy, dark green in summer, burgundy changing to orange in fall, leafs-out late, holds leaves late	non-fruiting	
‘Marshall’	3a	broadly oval, irregular at times	glossy dark green in summer, bright yellow in fall	usually but not always non-fruiting	fewer insect and disease problems then species
‘Patmore’	3a (2b)	oval to broadly pyramidal, straight trunk, good branch structure, symmetrical	glossy, dark green in summer, long-lasting yellow in fall	non-fruiting	relatively pest free
‘Summit’	3b	upright, oval to pyramidal, 25’-35’ wide straight trunk, good central leader, symmetrical	semi-glossy, excellent golden yellow in fall	light and infrequent crops	thicker bark, more resistant to mechanical damage
Urbanite®	5b	broadly pyramidal to oval	thick, leathery, lustrous dark green in summer, bronze-red in fall	none observed	thicker bark appears more sun -scald resistant

Available				
Cultivar	**Zone**	**Form/Habit**	**Foliage**	**Fruit**
‘Bergeson’	3 (2)	upright, oval, dense, rapid grower	lustrous dark green in summer, yellow in fall	non-fruiting
Centerpoint™	4	broadly oval to rounded, symmetrical	very glossy, yellowish in fall	non-fruiting
ChampTree™ (‘National 1999’)	4	rounded, upright spreading branches	glossy, yellow in fall	non-fruiting
DakotaCentennial™ (‘Wahpeton’)	3	oval to broadly pyramidal, tends to maintain central leader, good branch structure	glossy, bright green changes to dark green in summer, deep yellow in fall	non-fruiting
Georgia Gem™ (‘Oconee’)	6	upright-oval	larger leaves, glossy, dark green in summer, yellowish in fall	non-fruiting
Newport™ (‘Bailey’)	3b	oval, straight trunk, good branching	glossy dark green in summer, yellow in fall	non-fruiting
Prairie Spire™ (‘Rugby’)	3	upright-oval to narrow pyramidal, 20’ wide, dense branching	glossy, bright green changes to dark green in summer, golden yellow in fall	non-fruiting
Skyward™ (‘Wandell’)	5b	narrowly pyramidal, 20’ wide, dense	thick, semi-lustrous, bronze-red to purple in fall	non-fruiting
var. *lanceolata*	3	oval to rounded	lanceolate, golden yellow in fall	

Scientific Name: *Ginkgo biloba*
Common Name: Ginkgo, sometimes called Maidenhair Tree
Environmental Conditions:

Hardiness Zone: 4b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 8.2

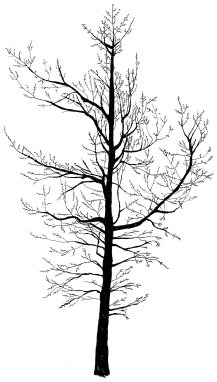
Insect/Disease Factors: relatively pest free
Growth Characteristics:

Height: 50'-80' (can reach over 100')
Width: greatly variable, 30'-40' is common, potentially wider than high at maturity
Form/Habit: variable, irregular when young, pyramidal with age, open, often large wide-spreading branches
Rate: slow

Ornamental Characteristics:

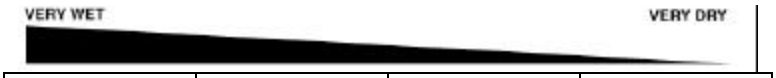
Flower: not ornamentally important, inconspicuous
Fruit: noxious smelling on female trees, specify male trees
Seasonal Foliage Color: bright green in summer, yellow in fall
Bark: light gray-brown, ridged and furrowed

Transplant Issues: difficult to transplant bare root, best planted B&B
Management Issues: specify male trees to avoid fruit litter and noxious fruit smell, easy fall clean-up as all leaves drop within just a couple days of each other
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: *all the following cultivars are male (non-fruiting)*
Common: **'Autumn Gold'** (50' high, 35' wide – perhaps broader later, symmetrical when young, broad, excellent golden yellow fall color), **'Lakeview'** (45' high, 25' wide, narrowly conical, upright, frequently irregular), **'Magyar'** (60' high, 30' wide, narrowly-pyramidal, uniform, upright branching), **Princeton Sentry®** (**'PNI 2720'**, 60' high, 25' wide, narrowly conical, upright, uniform branching)
Available: **'Golden Globe'** (zone 6, 80' wide, 30'-40' wide, denser branching habit), **Emperor™** (**'Woodstock'**, uniform oval form, strong central leader, good branching habit, good yellow fall color), **'Saratoga'** (40' high, 30' wide, distinct central leader, somewhat oval, good yellow fall color), **Shangri-la®** (45' high, 30' wide, uniform, compact pyramidal, good dense branching habit, good yellow fall color, faster growing)



Scientific Name: *Gleditsia triacanthos* var. *inermis*
Common Name: Thornless Common Honeylocust
Environmental Conditions:

Hardiness Zone: 4b (selected cultivars into 4a and 3b)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

Insect/Disease Factors: over-planting has encouraged severe insect problems in many areas, including spider mite borers, leaf spot, cankers, powdery mildew, wiches' broom, Honeylocust plant bug (**'Moraine'** and **Skyline®** have shown some resistance, green-leaved strains more tolerant such as **Shademaster®**, yellow-leaved strains very susceptible such as **Sunburst®**), mimosa webworm (**'Moraine'** resistant, **'Green Glory'** moderately resistant, **Imperial®** very susceptible), Thyronectria canker (**Halka™** resistant, **Imperial®**, **Shademaster®**, **Skyline®**, and **Trueshade®** partially resistant, **'Morraine'**, **Skyline®** and **Sunburst®** susceptible), and Nectria canker (**Sunburst®** susceptible)

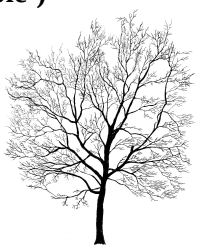
Growth Characteristics:

Height: 40'-80'
Width: 30'-70'
Form/Habit: oval to rounded, open, spreading
Rate: fast

Ornamental Characteristics:

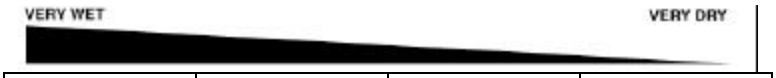
Flower: inconspicuous, not ornamentally important
Fruit: long brown pods, most cultivars have little to no fruit
Seasonal Foliage Color: light green in summer (dark green cultivars available), yellow in fall
Bark: attractive, dark gray-brown, develops scaly platy ridges and deep furrows with age
Other: drops leaves early

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: small leaves easy for fall clean-up
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: *all typically less than 50' high except 'Green Glory'*, **'Fairview'** (zone 3b, fast growing, essentially fruitless), **'Green Glory'** (zone 3b, similar to 'Moraine' pyramidal, strong central leader, fast growing, holds foliage late, essentially fruitless), **Halka™** (**'Christie'**, zone 4a (3b), full branching, develops heavier caliper at an early age, essentially fruitless), **Imperial®** (**'Impcole'**, zone 4a (3b), shorter, 30'-35' high, broadly rounded, good horizontal branching angles, essentially fruitless), **'Moraine'** (zone 3b, denser than species, upper branches ascending, lower branches more pendulous, dark green summer foliage, golden yellow fall color, fruitless form, reportedly susceptible to storm damage), **Shademaster®** (**'PNI 2835'**, zone 3b, high vase shaped canopy, dark green summer foliage, late to turn yellow-green in fall, essentially fruitless), **Skyline®** (**'Skycole'**, zone 3b, upright, broadly pyramidal, strong central leader, tight upright branching, dark green summer foliage, good yellow fall color), **True Shade®** (fast growing, shiny dark bark, essentially fruitless)
*Avoid **'Rubylace'** and **Sunburst® ('Suncole')**



Scientific Name: *Gymnocladus dioicus*
Common Name: Kentucky Coffeetree
Environmental Conditions:

Hardiness Zone: 4a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2

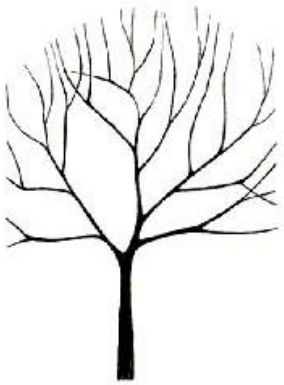
Insect/Disease Factors: relatively pest free
Growth Characteristics:

Height: 50'-70'
Width: 40'-50'
Form/Habit: very sparse branching when young, oval to vase shaped, upward arching branches, open, unique and irregular, coarse yet particularly interesting and picturesque in winter, provides filtered shade in summer, male trees often more upright
Rate: medium

Ornamental Characteristics:

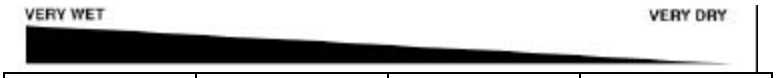
Flower: greenish-white or yellowish-white pyramidal clusters, late spring, 8"-12" on female trees, 3"-4" on male trees, female has rose fragrance
Fruit: leathery, reddish-brown to black, 4"-10" long pods in fall, persist throughout winter
Seasonal Foliage Color: emerges late spring with pinkish-purplish tinge, changing to blue-green in summer, potentially good yellow in fall
Bark: attractive, gray-brown to dark brown, rough, with hard thin and scaly ridges curling outward exposing an orange-brown color

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: use of male tree eliminates fruit litter problem
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: 'Espresso' (male non-fruiting form)



Scientific Name: *Liquidambar stryraciflua*
Common Name: American Sweetgum
Environmental Conditions:

Hardiness Zone: 5b, northern seed source recommended or reliably cold hardy cultivar
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: $\leq$ 7.5

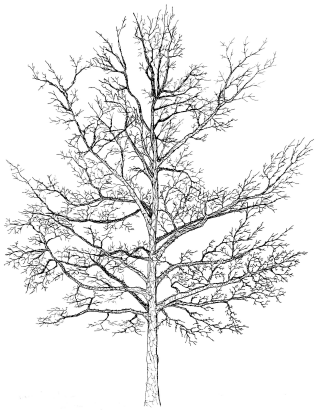
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 50'-75' (80'-120' in the wild)
Width: 40'-65'
Form/Habit: pyramidal when young, oval to round with age, straight trunk
Rate: medium to fast

Ornamental Characteristics:

Flower: not ornamentally important, present as leaves are emerging and expanding
Fruit: 1"-1 ½" ball of dehiscent capsules, persist into winter
Seasonal Foliage Color: glossy deep green in summer, great variability in fall, yellow/orange/red/purple tones, typically excellent fall color
Bark: grayish-brown, somewhat rounded ridges and deep furrows

Transplant Issues: transplant B&B, not bare root
Management Issues: fruit litter may be objectionable
Suggested Uses: narrow or wide street tree lawns/pits, parks
Cultivars: Gold Dust® (‘Goduzam’, reliably cold hardy in zone 5, gold and green variegated, strongly star-shaped leaves, fall color adds pink and burgundy tones), **Grandmaster™ (‘Grazam’**, reliably cold hardy in zone 5, retains pyramidal form with age, star-shaped leaves, orange to reddish-purple fall color), **‘Moraine’** (most cold hardy cultivar, reportedly to zone 4b, uniform, upright-oval habit, fast growing, bright red to burgundy fall color), **‘Rotundaloba’** (not as hardy, zone 6 (5b), rounded leaf lobes, fruitless), **‘Worplesdon’** (mixed reports on hardiness, possibly not as hardy, only zone 6, uniquely lobed leaves, apricot-orange or purple fall color)



Scientific Name: *Liriodendron tulipifera*
Common Name: Tuliptree or Tulip Poplar
Environmental Conditions:

Hardiness Zone: 5a (4b), northern seed source recommended
Soil Moisture:

occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun
Salt: sensitive
pH: $\leq$ 8.2

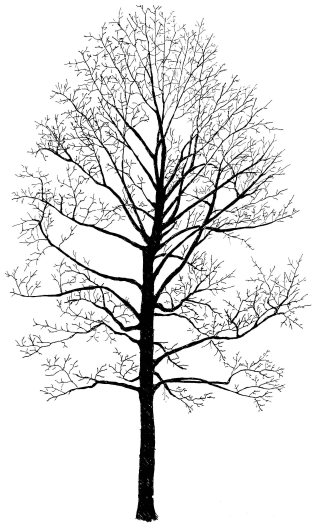
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 70'-90' (can grow 150'+ in wild)
Width: 35'-50'
Form/Habit: somewhat pyramidal in youth, oval with age
Rate: medium to fast

Ornamental Characteristics:

Flower: tulip shaped, 2" upright, pale green, deep orange at base, late spring to early summer
Fruit: cone like cluster of woody samaras
Seasonal Foliage Color: bright green in summer, yellow in fall
Bark: gray to gray-brown, furrowed with tight, lighter colored, interlacing, round to flat ridges

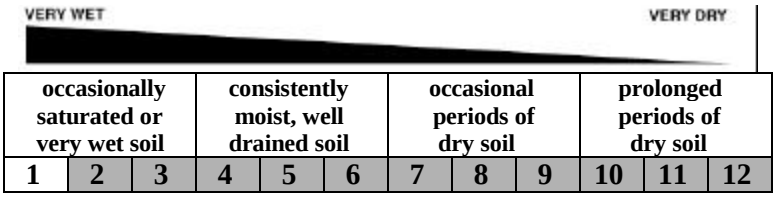
Transplant Issues: difficult to transplant B&B or bare root, B&B transplanting in small caliper is best
Management Issues: soft bark easily damaged by mechanical injury, leaf yellowing followed by leaf drop can be a real problem if trees do not receive adequate water
Suggested Uses: wide street tree lawns/pits or parks due to size and drought sensitivity
Cultivars: 'Fastigiatum' or 'Arnold' (narrow form, 50'-60' high, 15'-25' wide)



Scientific Name: *Maclura pomifera* var. *inermis* (male)
Common Name: Osage Orange
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun

Salt: some observed tolerance

pH: $\leq$ 8.2

Insect/Disease Factors: relatively pest free

Growth Characteristics:

Height: 30'-50'

Width: 30'-50'

Form/Habit: irregular, rounded, typically low branching, stiff interlacing branches, sometimes branches show pendulous tendency

Rate: fast

Ornamental Characteristics:

Flower: not ornamentally important

Fruit: baseball size green-yellow fruit on female trees in fall

Seasonal Foliage Color: bright, glossy medium to dark green in summer, yellow-green to good yellow in fall

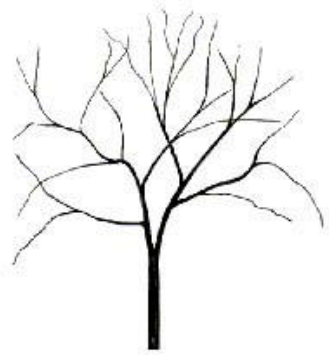
Bark: attractive, orange-brown inner bark seen though shredding gray-brown outer bark

Transplant Issues: easy to transplant B&B

Management Issues: use of male tree eliminates fruit litter problem**,** var. *inermis* is completey thornless (except for juvenile stems, which occasionally have thorns)

Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™, useful as a windbreak

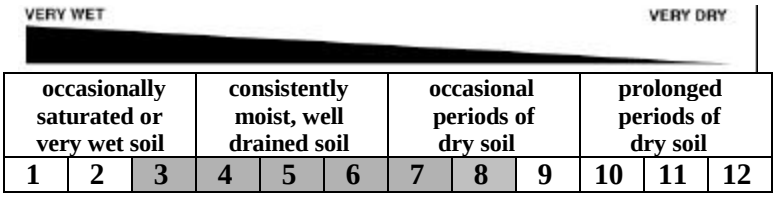
Cultivars: 'Double O' (male, thornless except juvenile stems), **'Park'** (thornless male), **'Wichita'** (thornless male, upright-spreading habit), availability of any cultivar may be limited



Scientific Name: *Metasequoia glyptostroboides*
Common Name: Dawn Redwood
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



Sun/Shade: full sun

Salt: unknown

pH: ≤ 8.2

Insect/Disease Factors: none serious or limiting, although mites can cause defoliation under drought stress

Growth Characteristics:

Height: 70'-100'

Width: 25'-50'

Form/Habit: pyramidal, single straight trunk, tapered with a buttressed base, develops an irregular fluted character and armpit-like depressions below the branch attachments to central leader

Rate: fast

Ornamental Characteristics:

Flower: not ornamentally important

Fruit: 1" pendulous cones

Seasonal Foliage Color: bright green in summer, brown in fall, often pinkish/orange-brown to red-brown

Bark: reddish brown, fissured, finely shredding and exfoliating

Transplant Issues: easy to transplant B&B

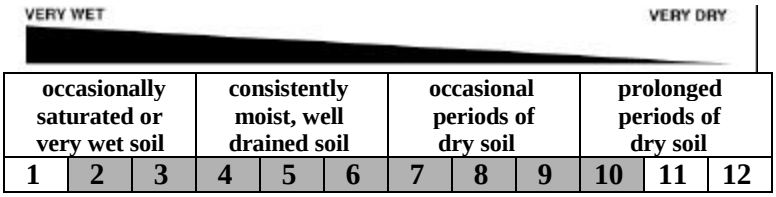
Management Issues: lower branch attachments would require removal for typical street tree use

Suggested Uses: exceptionally wide street tree lawns/pits with pruning or parks due to size, low branching, and drought sensitivity

Cultivars: very limited availability, **'National'** and **'Sheridan Spire'** were selected for narrow growth habits, **'Sheridan Spire'** is likely more upright, compact and columnar growing than **'National'**, **'National'** may be more susceptible to canker problems than species

Scientific Name: *Nyssa sylvatica*
Common Name: Black Tupelo, also known as Sour Gum or Black Gum
Environmental Conditions:

Hardiness Zone: 5a
Soil Moisture:



Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 7.5

Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 30'- 60' (although rare, can grow to 100'+)
Width: 20'- 40'
Form/Habit: pyramidal when young, dense, horizontal branching, sometimes pendulous lower branches, varies with age between two distinct forms, either an irregular-rounded and often flat-topped form or an oval to pyramidal form
Rate: slow to medium

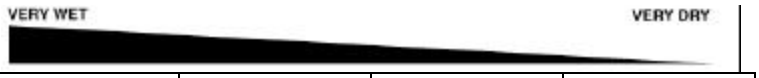
Ornamental Characteristics:

Flower: not ornamentally important
Fruit: not ornamentally important, fairly inconspicuous, ½" long blue-black drupes in pairs or clusters, eaten by birds and mammals
Seasonal Foliage Color: glossy green in summer, great variability in fall (yellow/orange/red/purple tones), typically excellent fall color
Bark: color variable, dark gray to brown, often silvery or almost black, texture variable, at times irregular ridges broken into short segments, other times almost scaly

Transplant Issues: difficult to transplant, use small caliper B&B only, slow to recover from transplanting
Management Issues: fruits (found on older trees) can stain sidewalk and may cause litter problem
Suggested Uses: narrow or wide street tree lawns/pits, parks
Cultivars: strongly weeping form **'Autumn Cascades'** is available but not suitable for street tree use

Scientific Name: *Ostrya virginiana*
Common Name: American Hophornbeam (also known as Ironwood, but should not be confused with *Carpinus caroliniana*, which is more commonly called Ironwood)
Environmental Conditions:

Hardiness Zone: 3b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: prefers full sun, tolerates partial shade
Salt: very sensitive
pH: ≤ 8.2

Insect/Disease Factors: none serious or limiting if healthy, two-lined chestnut borer can destroy stressed trees
Growth Characteristics:

Height: 30'-50'
Width: 20'-30'
Form/Habit: oval to pyramidal in youth, oval to rounded with age, horizontal and drooping branching, should specify single-stem form as multi-stem form is available
Rate: slow

Ornamental Characteristics:

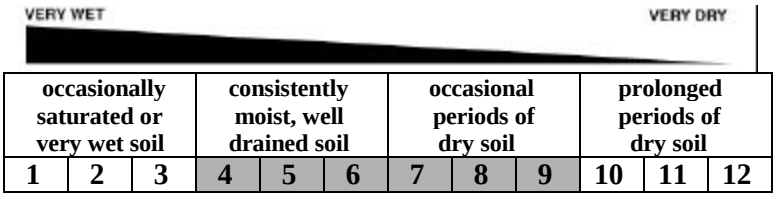
Flower: female visible in spring, but not showy, male visible in winter, 1" long catkins in clusters
Fruit: small, greenish-white, inflated pods in tight hanging clusters (hop-like, hence the common name)
Seasonal Foliage Color: dark green in summer, yellow in fall
Bark: attractive, light grayish brown, shredded look

Transplant Issues: difficult to transplant B&B or bare root, slow to recover from transplanting
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks
Cultivars: none known

Scientific Name: *Phellodendron amurense*
Common Name: Amur Corktree
Environmental Conditions:

Hardiness Zone: 4b (3b)

Soil Moisture:



Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2

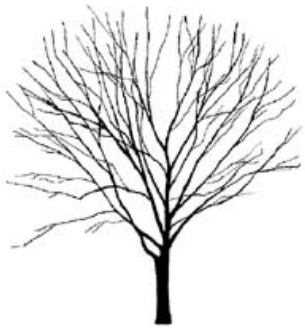
Insect/Disease Factors: relatively pest free
Growth Characteristics:

Height: 30'-45'
Width: 30'-40'
Form/Habit: broadly vase-shaped to rounded, open with massive branches, often horizontally arranged, shorter trunk common
Rate: slow

Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous
Fruit: not ornamentally important, small, black
Seasonal Foliage Color: often glossy dark green in summer, yellow to bronzy-yellow in fall
Bark: attractive, light gray-brown, corky, furrowed

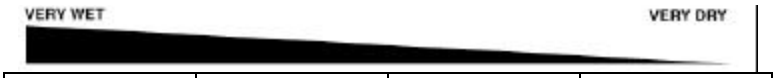
Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: fruit on female trees may be a litter problem and can stain sidewalks, may naturalize when planted next to open areas, use male cultivar to avoid both potential problems
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: 'His Majesty' (*P. sachalinense* x *P. amuerense*, zone 3, male, fruitless, broadly vase-shaped, fast growing, yellow fall color), **Eye Stopper ™ ('Long Necker'**, actually *P. lavallei* cultivar selected for bright yellow fall color, *P. lavallei* has a higher height at maturity, more upright branching, duller green leaves, and slightly less corky bark than *P. amuerense*), **Macho®** (vigorous male, fruitless, broadly vase-shaped, thick leathery leaves, yellow fall color), **Shademaster® ('PNI 4551'**, sometimes listed as zone 3, male, fruitless, good branching structure, glossy foliage, yellow fall color)



Scientific Name: *Platanus* x *aceriflolia*
Common Name: London Planetree
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun

Salt: some observed tolerance

pH: ≤ 8.2

Insect/Disease Factors: over planting has encouraged disease and insect problems, of those cankerstain, anthracnose (hybrid shows considerable variation in resistance, **'Columbia'** & **'Liberty'** resistant to eastern strains, **'Bloodgood'** moderately resistant to eastern strains, **Metroshade™** reportedly resistant to eastern strains, and **'Yardwood'** is likely resistant to eastern strains) and powdery mildew (**'Yardwood'** resistant, **Metroshade™** reportedly resistant, conflicting reports on **'Columbia'**, **'Liberty'**, and **'Bloodgood'**) are common

Growth Characteristics:

Height: 70'-100'

Width: 65'-80'

Form/Habit: pyramidal when young, open and spreading with age, develops massive branches

Rate: medium

Ornamental Characteristics:

Flower: not ornamentally important

Fruit: 1" globe-shaped (syncarp), pendulous, on long stalks, mostly in pairs, persist into winter

Seasonal Foliage Color: medium to dark green in summer, yellow-brown in fall

Bark: extremely showy, mottled with cream, olive, and light brown colors

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root

Management Issues: frost cracking is common, roots will heave sidewalks, bark/leaf/fruit litter may be a nuisance

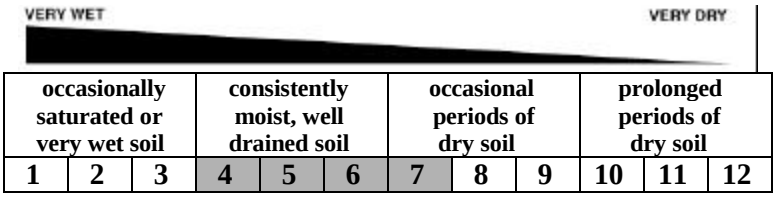
Suggested Uses: wide street tree lawns/pits or parks due to size, suitable for CU-Structural Soil™

Cultivars: 'Bloodgood' (tolerates severe pruning, fast growing), **'Columbia'** (zone 6, more deeply lobed leaves)**, 'Liberty', Metroshade™** (**'Metzam'**, cinnamon colored new growth), **'Yarwood'** (possibly not as hardy, reportedly only into zone 6, fast growing, bark exfoliates at younger age)

'Bloodgood'

Scientific Name: *Prunus sargentii*
Common Name: Sargent Cherry
Environmental Conditions:

Hardiness Zone: 4b (5a for reliable flowering)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 7.5

Insect/Disease Factors: none incapacitating
Growth Characteristics:

Height: 40'-50'
Width: 20'-30', equal to height possible
Form/Habit: vase-shaped to rounded
Rate: medium to fast

Ornamental Characteristics:

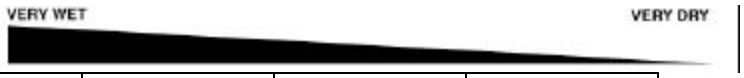
Flower: showy, pink, early spring before leaves, hardy buds
Fruit: small, purple-black cherries, summer, not showy
Seasonal Foliage Color: emerges with reddish tinge in spring, glossy dark green in summer, yellow to bronze-red in fall
Bark: attractive, polished mahogany-red color

Transplant Issues: easy to transplant B&B or $\leq$ 2" caliper bare root
Management Issues: cherries are short-lived trees (only 50 years in good site), fruit could stain sidewalk and be a nuisance in some situations
Suggested Uses: narrow or wide street tree lawns/pits, parks
Cultivars: 'Columnaris' (not true columnar, just narrower form with definite upright branching, 10'-20' wide, likely shorter, 30'-40' high, often flowers slightly later than species with emerging leaves instead of before leaves)

Scientific Name: *Pyrus calleryana*
Common Name: Callery Pear
Environmental Conditions:

Hardiness Zone: 5a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun

Salt: some observed tolerance

pH: ≤ 8.2

Insect/Disease Factors: susceptible to fireblight, see cultivars for resistance

Growth Characteristics:

Height: 30'-50'

Width: 20'-40'

Form/Habit: pyramidal in youth, broadens with age to oval or rounded, dense branching and foliage

Rate: fast

Ornamental Characteristics:

Flower: showy, white clusters, spring before or as leaves emerge

Fruit: ½" greenish to tan, in clusters

Seasonal Foliage Color: glossy dark green in summer, fall color variable (yellow/orange/red/purple) but usually excellent

Bark: brown, lightly ridged and furrowed with age, sometimes grayish and blocky with age as well

Other: holds leaves late

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root

Management Issues: branching angles and branch density combined with late holding leaves may make species prone to early winter ice/snow storm damage, cultivar 'Bradford' is no longer recommended because of tendency for severe limb breakage, newer cultivars with improved branching habits are available, graft incompatibility can be a problem

Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™

Cultivars: see chart on following page, selections made for growth form, improved branching habit, flowering, fall color, and disease resistance, see small tree section for *Pyrus* under 30'

'Autumn Blaze'

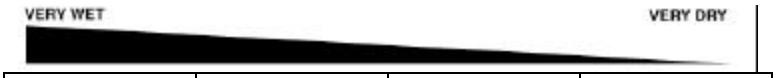
Pyrus calleryana* (Callery Pear) cultivars*:

Cultivar	Zone	Form/Habit	Fall Foliage	Disease Resistance	Other
Aristocrat®	5a	broadly pyramidal, wider branch angles, more open	variable, yellow to deep red	slightly fireblight susceptible	later bloomer, sparser flowering, but still showy, wavy leaf margins
'Autumn Blaze'	5a (4b)	rounded, can be irregular, more open, wider branch angles	early, reliable red	fireblight susceptible	leaves emerge with red tint in spring, drops leaves earlier
Burgundy Snow™ ('Bursnozam')	4	pyramidal			burgundy flower centers, heavy flowering, leaves are not dark green
'Cambridge'	4	upright, narrow-pyramidal, 15' wide	bright orange		
'Capital'	5b (5a)	columnar, central leader, 15' wide, more upright than 'Whitehouse'	copper-red to red-purple	slightly fireblight susceptible	very glossy leaves
Chanticleer® ('Glens' Form') same as **'Cleveland Select'** same as **'Stonehill'**	5a (4b)	upright, narrow-pyramidal, 15'-20' wide, multiple leaders common, even branching	gold-red to plum	fireblight tolerant	heavier and later (a week) flowering, enters dormancy earlier
'Fauriei' sometimes listed as *P. calleryana* var. *fauriei* or *P. fauriei*	5a	pyramidal to rounded, wider branch angles, slower growing	early, variable	fireblight tolerant	heavy flowering, leaves leathery, drops leaves earlier
Frontier™ ('Fronzam')	4	narrow oval, 15-20' wide	likely variable		very dark green leaves
Gladiator™ ('Glazam')	4	pyramidal, strong central leader, fast growing	likely variable		
New Bradford® ('Holmford')	5	broadly oval to rounded	yellow to orange-red		
'Redspire'	5a	pyramidal to oval, dense, symmetrical, slower growing	often poor in north, variable	fireblight tolerant	heavy flowering, enters dormancy earlier, thick leaves
'Trinity	5b (5a)	broadly oval to rounded	consistent, orange-red		heavy flowering, light green leaves
'Whitehouse'	5b (5a)	narrow pyramidal, 15'-20' wide, strong central leader	early, reddish purple	slightly fireblight susceptible, highly leaf-spot susceptible	leaves held late

Scientific Name: *Quercus acutissima*
Common Name: Sawtooth Oak
Environmental Conditions:

Hardiness Zone: 5b or 6a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 7.5

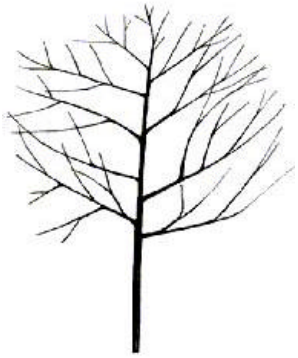
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 40'-50'
Width: 35'-55'
Form/Habit: broadly pyramidal in youth, oval-rounded to broad-rounded with age, dense
Rate: medium (fast for an Oak)

Ornamental Characteristics:

Flower: attractive, pendent, golden, 3-4" male catkins, early spring as leaves emerge
Fruit: acorn, often heavy crops on older trees
Seasonal Foliage Color: leaves emerge yellow to light green in spring, lustrous green in summer, yellow to golden brown in fall, late to turn color in fall
Bark: attractive, gray-brown, deeply ridged and furrowed, almost corky on older trunks
Other: young trees hold leaves throughout winter

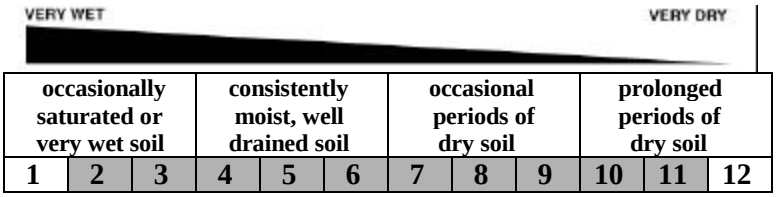
Transplant Issues: transplant B&B
Management Issues: acorns on older trees may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size
Cultivars: **'Gobbler'** is the name given to seedlings that produce early and abundant acorns for wild turkey food, extremely limited availability



Scientific Name: *Quercus bicolor*
Common Name: Swamp White Oak
Environmental Conditions:

Hardiness Zone: 4a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun

Salt: unknown

pH: $\leq$ 7.5 (variable susceptibility to iron chlorosis in high pH soils)

Insect/Disease Factors: none serious or limiting

Growth Characteristics:

Height: 50'-60'

Width: 50'-60'

Form/Habit: broad, rounded, open, typically has shorter trunk

Rate: slow

Ornamental Characteristics:

Flower: catkins, spring

Fruit: acorn, heavy crops at 3-5 year intervals

Seasonal Foliage Color: lustrous, leathery, dark green in summer (if soil has appropriate pH), yellowish in fall, sometimes red-purple in fall

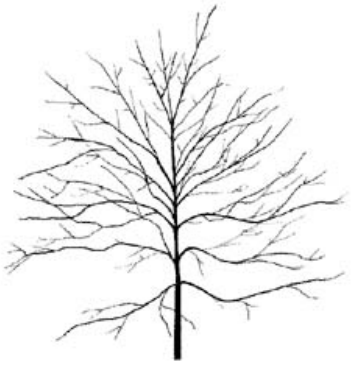
Bark: attractive, grayish brown, flaky and divided into deep longitudinal fissures with flat ridges

Transplant Issues: easy to transplant B&B or $\leq$ 2" caliper bare root

Management Issues: acorns may be a litter problem certain years

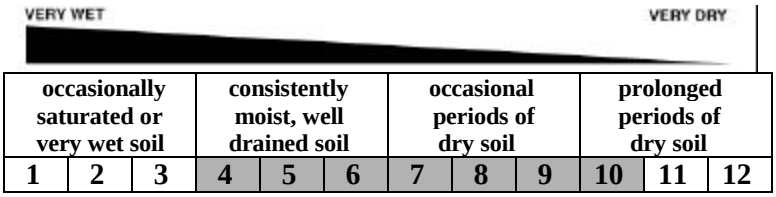
Suggested Uses: wide street tree lawns/pits or parks preferred due to size

Cultivars: none known



Scientific Name: *Quercus coccinea*
Common Name: Scarlet Oak
Environmental Conditions:

Hardiness Zone: 5a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun
Salt: unknown
pH: $\underline{<}$ 7.5
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 60'-70' (can reach 100'+ in wild)
Width: 40'-50'
Form/Habit: round, open
Rate: slow

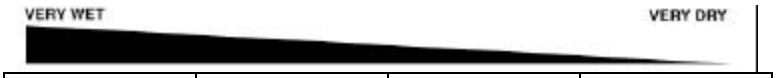
Ornamental Characteristics:

Flower: catkins, spring as leaves emerge
Fruit: acorn
Seasonal Foliage Color: glossy dark green in summer, russet-red to brilliant scarlet in fall, late to turn color in fall
Bark: gray-brown
Other: leaves persist throughout winter, particularly on young trees

Transplant Issues: difficult to transplant B&B or bare root
Management Issues: acorns may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size
Cultivars: none available

Scientific Name: *Quercus imbricaria*
Common Name: Shingle Oak
Environmental Conditions:

Hardiness Zone: 5a (4b if hardy parent material selected)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun
Salt: unknown
pH: ≤ 7.5

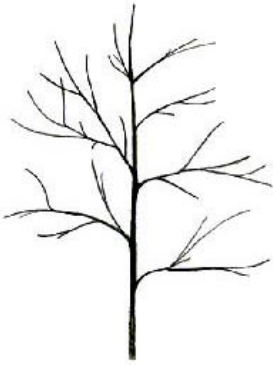
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 40'-60' (can grow 80'-100')
Width: 40'-65'
Form/Habit: pyramidal to upright-oval in youth, broad-rounded outline with age, often lower lateral branches droop
Rate: slow

Ornamental Characteristics:

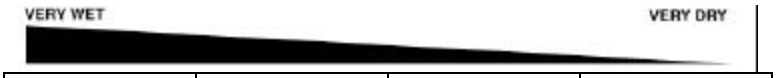
Flower: pale yellow-green catkins, spring as leaves emerge
Fruit: acorn
Seasonal Foliage Color: leaves unfold reddish in spring, lustrous dark green in summer, yellow-brown to russet-red in fall
Bark: gray-brown, shallow furrows, close low ridges that broaden with age
Other: leaves persist throughout winter

Transplant Issues: difficult to transplant B&B or bare root, slow to recover from transplanting
Management Issues: acorns may be a litter problem certain years although reportedly less of a litter problem than with other oaks, accepts pruning well
Suggested Uses: wide street tree lawns/pits or parks preferred due to size
Cultivars: none known



Scientific Name: *Quercus macrocarpa*
Common Name: Bur Oak or Mossycup Oak
Environmental Conditions:

Hardiness Zone: 3a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2

Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 60'-80' (can grow 100'+)
Width: 60'-90', typically equal or slightly greater than height
Form/Habit: weakly pyramidal to oval in youth, broadly rounded and open with age
Rate: slow

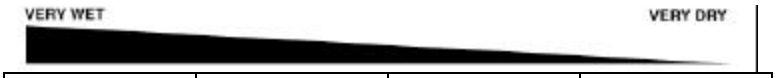
Ornamental Characteristics:

Flower: pale yellowish catkins, spring as leaves emerge
Fruit: acorn, heavy crops at 3-5 year intervals
Seasonal Foliage Color: leathery, lustrous dark green in summer, yellow-green to yellow-brown in fall
Bark: dark gray to gray-brown, rough, corky, thick, developing deep ridges and furrows

Transplant Issues: difficult to transplant B&B or bare root, transplant small caliper trees
Management Issues: acorns may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size, suitable for CU-Structural Soil™
Cultivars: none known

Scientific Name: *Quercus muehlenbergii*
Common Name: Chinkapin Oak, sometimes called Yellow Chestnut Oak
Environmental Conditions:

Hardiness Zone: 5a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2

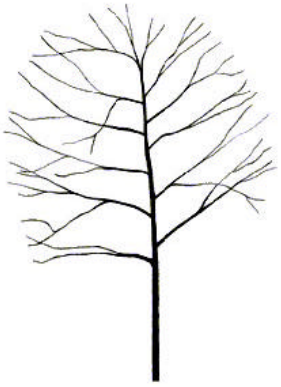
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 30'-50'
Width: 30'-60', usually greater than height at maturity
Form/Habit: round
Rate: medium in youth, slow with age

Ornamental Characteristics:

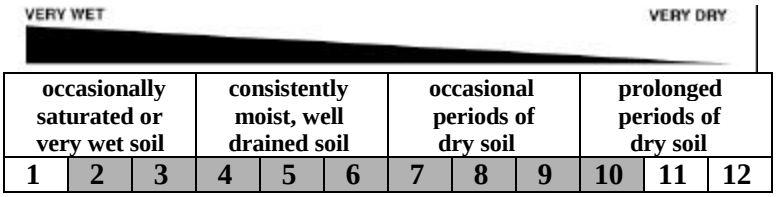
Flower: not ornamentally important, inconspicuous
Fruit: acorn
Seasonal Foliage Color: lustrous dark yellow-green in summer, yellow to orange-brown to brown in fall
Bark: gray, rough and flaky

Transplant Issues: difficult to transplant B&B or bare root, only transplant B&B
Management Issues: acorns may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size, suitable for CU-Structural Soil™
Cultivars: none known



Scientific Name: *Quercus palustris*
Common Name: Pin Oak
Environmental Conditions:

Hardiness Zone: 5a
Soil Moisture:



Sun/Shade: full sun
Salt: sensitive
pH: ≤ 7.0 (iron chlorosis in high pH soils)

Insect/Disease Factors: over planting has encouraged problems, including gypsy moth, oak wilt, galls, and cankers, resistant to anthracnose

Growth Characteristics:

Height: 50'-70' (can reach 100'+)
Width: 40'-50'
Form/Habit: pyramidal in youth, oval with age, strong central leader, distinct branching habit – upper branches upright, middle branches horizontal, and lower branches descending
Rate: fast for an oak

Ornamental Characteristics:

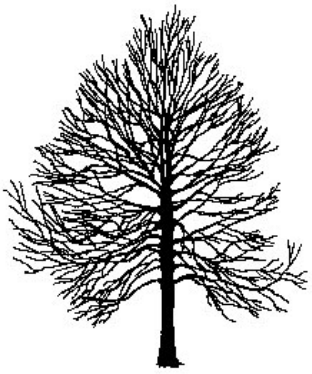
Flower: pale yellow-green catkins, spring as leaves emerge
Fruit: acorns
Seasonal Foliage Color: glossy dark green (if soil has appropriate pH) in summer, scarlet in fall
Bark: gray-brown, thinner, smooth, develops narrow ridges and shallow furrows with age
Other: young trees hold leaves throughout winter

Transplant Issues: only transplant B&B, moderately difficult to transplant bare root, better success in transplanting bare root in fall, do not attempt to transplant > 2" caliper trees bare root

Management Issues: acorns may be a litter problem certain years, descending lower branches may need pruning where clearance is needed

Suggested Uses: wide street tree lawns/pits or parks preferred due to size

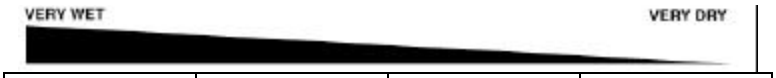
Cultivars: 'Green Pillar' (also called **'Emerald Pillar'**, columnar form, delayed graft incompatibility may be a problem), **'Crownright'** and **'Sovereign'** (lower branches are more upright) were taken out of production due to delayed graft incompatibility problems



Scientific Name: *Quercus phellos*
Common Name: Willow Oak
Environmental Conditions:

Hardiness Zone: 6a

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 7.5 (iron chlorosis in high pH soils)
Other: specify northern seed source if needed

Insect/Disease Factors: susceptible to trunk borers, scale, and oak wilt, although rarely serious or limiting, resistant to anthracnose

Growth Characteristics:

Height: 40'-60' (can reach 100'+ in ideal conditions)
Width: 30'-60'
Form/Habit: pyramidal in youth, oval to round with age, dense crown, lower branches sometimes descending/pendulous
Rate: medium

Ornamental Characteristics:

Flower: pale yellow-green catkins, spring as leaves emerge
Fruit: acorn, small
Seasonal Foliage Color: light green in spring, dark green in summer (if soil has appropriate pH), color variable in fall (brown, yellow, bronze-orange, russet-red)
Bark: gray-brown, becoming lightly ridged and furrowed with age
Other: leaves persist throughout winter

Transplant Issues: best transplanted B&B

Management Issues: acorns may be a litter problem certain years, descending/pendulous lower branches may require removal where clearance is needed

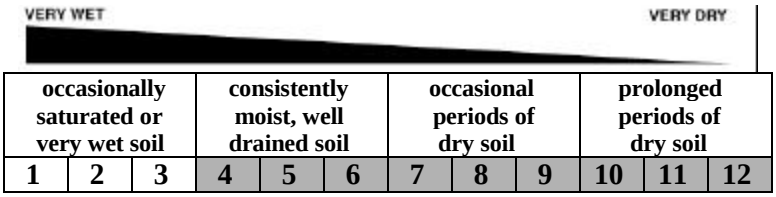
Suggested Uses: wide street tree lawns/pits or parks preferred due to size

Cultivars: none known

Scientific Name: *Quercus robur*
Common Name: English Oak
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

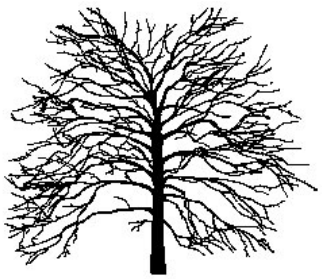
Insect/Disease Factors: powdery mildew is a serious problem, **Attention!**, **Crimson Spire™**, **Regal Prince®**, **Rosehill®**, **Skymaster™**, and **Skyrocket™** show varying levels of resistance
Growth Characteristics:

Height: 40'-60' (can reach 75'-100'+)
Width: 40'-60'
Form/Habit: broadly rounded, open
Rate: slow to medium

Ornamental Characteristics:

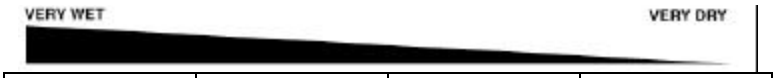
Flower: pale yellow-green catkins, spring as leaves emerge
Fruit: acorn
Seasonal Foliage Color: dark green to blue-green in summer, brown in fall
Bark: grayish black, deeply furrowed

Transplant Issues: moderately difficult to transplant bare root, better success in transplanting bare root in fall, do not attempt to transplant > 2" caliper trees bare root, best transplanted B&B
Management Issues: acorns may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size, suitable for CU-Structural Soil™
Cultivars: Attention! (**'DTR 105'**, columnar form, dense, 15' wide, dark green foliage, bronze fall color, good mildew resistance), **Crimson Spire™** (**'Crimschmidt'**, *Q.alba* x *Q. robur*, columnar form, 15' wide, faster growing, dark green mildew resistant foliage, reddish fall color), **Regal Prince®** (**'Long'**, *Q. robur* x *Q. bicolor*, zone 4, columnar to narrow oval habit, 15'-20' wide, glossy bright green summer foliage, yellow fall color, highly mildew resistant), **Rosehill'®** (**'Asjes'**, *Q. robur* x *Q. bicolor*, zone 4, narrow oval habit, 20' wide, glossy pure green summer foliage, yellow fall color, good mildew resistance), **Skymaster™** (**'Pyramich'**, narrow when young, pyramidal with age, 25'-30' wide, strong central leader, good branching angles, reportedly mildew resistant), **Skyrocket™** (uniform columnar habit, 15' wide, leafs out early, yellow-brown fall color, reportedly moderately mildew resistant)
* **'Fastigiata'** (columnar form, 15'-20' wide, not recommended due to variability from seed propagation, resulting in potential iron chlorosis in high pH soils and powdery mildew susceptibility)



Scientific Name: *Quercus rubra*
Common Name: Northern Red Oak
Environmental Conditions:

Hardiness Zone: 3b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 7.5

Insect/Disease Factors: oak wilt is a serious problem in more southern areas, resistant to anthracnose
Growth Characteristics:

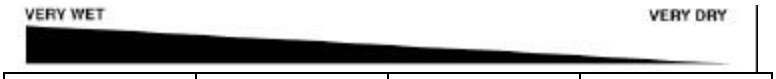
Height: 60'-80' (can grow 90'-100' in wild)
Width: 50'-70'
Form/Habit: round
Rate: fast for an oak

Ornamental Characteristics:

Flower: catkins, spring
Fruit: acorn, heavy crops at 3-5 year intervals
Seasonal Foliage Color: emerge reddish in spring, lustrous dark green in summer, russet-red to bright red in fall, sometimes disappoints with only yellow-brown fall color
Bark: gray, nearly black with age, wide flat-topped silver-gray ridges, separated by shallow fissures, deeply ridged and furrowed on older trunks

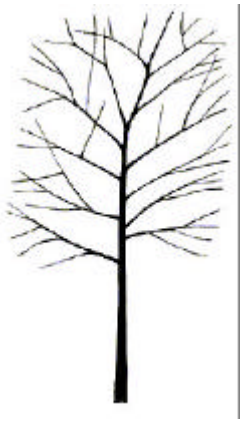
Transplant Issues: only transplant B&B, moderately difficult to transplant bare root
Management Issues: acorns may be a litter problem certain years
Suggested Uses: wide street tree lawns/pits or parks preferred due to size
Cultivars: none available

Scientific Name: *Quercus shumardii*
Common Name: Shumard Oak
Environmental Conditions:
Hardiness Zone: 5b or 6a



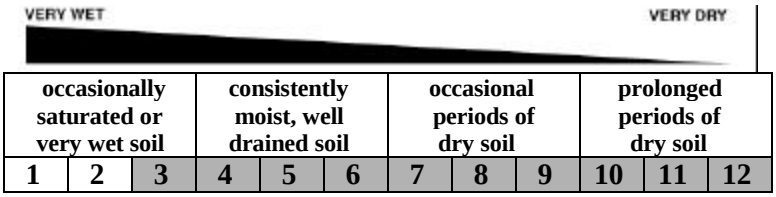
occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2
Insect/Disease Factors: seldom serious or limiting
Growth Characteristics:
Height: 60'-80' (can reach 100'+ in wild)
Width: 45'-65'
Form/Habit: pyramidal in youth, oval to round with age
Rate: slow to medium
Ornamental Characteristics:
Flower: pale yellow-green catkins as leaves emerge
Fruit: acorn
Seasonal Foliage Color: dark green in summer, yellow-bronze possible in fall, russet-red in fall typical
Bark: gray-brown, developing somewhat platy ridges and furrows with age
Transplant Issues: moderately difficult to transplant B&B, best to transplant B&B
Management Issues: acorns may be a litter problem certain years, best to prune in late summer or fall due to "bleeding" in spring
Suggested Uses: wide street tree lawns/pits or parks preferred due to size
Cultivars: none available



Scientific Name: *Robinia pseudoacacia*
Common Name: Black Locust
Environmental Conditions:

Hardiness Zone: 4b
Soil Moisture:



Sun/Shade: prefers full sun, tolerates full shade
Salt: some observed tolerance
pH: ≤ 8.2

Insect/Disease Factors: borers can be a serious problem, leaf miners may also be problematic
Growth Characteristics:

Height: 40'-50' common, can grow 70'-80'
Width: 20'-35'
Form/Habit: open, irregular-oval, upright branching
Rate: fast

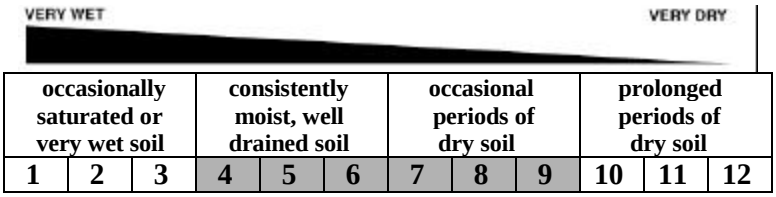
Ornamental Characteristics:

Flower: pendulous, white, 4"-8" long clusters, late spring, fragrant
Fruit: brown-black, flat, 2"-4"long pod, may persist into winter
Seasonal Foliage Color: dull blue-green in summer, yellow-green in fall
Bark: dark gray, with interlacing ridges, ropy appearance

Transplant Issues: easy to transplant B&B, **'Pyramidalis'** (although cultivar not recommended) and **'Purple Robe'** are easy to transplant ≤ 2" caliper bare root
Management Issues: fruit litter could be problematic, as well as thorns, in certain locations
Suggested Uses: narrow or wide street tree lawns/pits (widely used as street tree in Europe), parks, suitable for CU-Structural Soil™, good in very difficult reclamation sites (fixes own nitrogen)
Cultivars: 'Frisia' (spines are red on young shoots, yellow foliage in summer, does not retain yellow color as well in cooler climates), **'Idahoensis'** (commonly called **Pink IdahoLocust,** *Robinia* x *ambigua*, zone 3, 25'-40' high, 15'-30' wide, rose-pink flowers), **'Purple Robe'** (zone 3, only 40' high, rounded form, dark pink flowers, new growth has purple tint, bronze-green summer foliage, still yellowish in fall)
* **'Pyramidalis'** (sometimes called **'Fastigiata'**, narrower, columnar form, spineless, sparse flowering) is not recommended as it is not as hardy as species and is subject to dieback
*see small tree section for *Robinia* cultivars under 30' tall

Scientific Name: *Sorbus alnifolia*
Common Name: Korean Mountainash
Environmental Conditions:

Hardiness Zone: 4b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: prefers full sun, tolerates partial shade
Salt: unknown
pH: ≤ 8.2

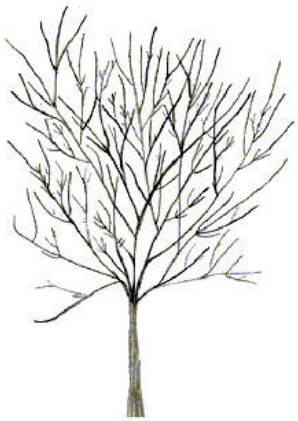
Insect/Disease Factors: *Sorbus* have potentially many minor pest problems and two major problems – fireblight and borers (borers are particularly problematic if tree is stressed or weakened), *S. alnifolia* is considered the least susceptible to borer injury but is reportedly slightly susceptible to fireblight
Growth Characteristics:

Height: 30'-40' (can grow 50'-60', although rarely)
Width: 20'-30', can reach equal to height
Form/Habit: pyramidal in youth, oval to rounded with age
Rate: medium to fast

Ornamental Characteristics:

Flower: showy, white loose clusters, late spring, heavy flowering alternate years
Fruit: pink-red to orange-red berries in loose clusters, fall, persistent
Seasonal Foliage Color: lustrous dark green in summer, yellow to orange in fall
Bark: smooth silvery gray

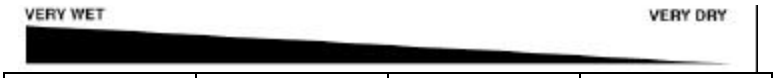
Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: harder wooded than other *Sorbus*, hence storm damage less likely
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: none available



Scientific Name: *Styphnolobium japonicum (Sophora japonica)*
Common Name: Japanese Pagodatree or Scholar-tree
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun

Salt: some observed tolerance

pH: ≤ 8.2

Insect/Disease Factors: twig die-back and stem canker common in colder zones, although not considered serious and are rarely limiting, **Millstone™** less susceptible to stem canker than species, **Regent®** and **'Princeton Upright'** resistant to leafhoppers

Growth Characteristics:

Height: 40'-60'

Width: 35'-55'

Form/Habit: oval to round, upright spreading branches

Rate: medium to fast

Ornamental Characteristics:

Flower: showy, creamy white, 6"-12" long clusters, summer

Fruit: bright green changing to yellow-brown pods in clusters, may persist through winter

Seasonal Foliage Color: lustrous bright green in summer, yellowish in fall, late to turn color in fall

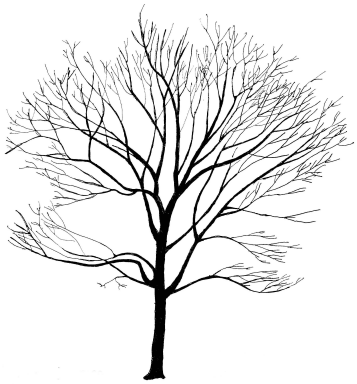
Bark: grayish brown, furrowed with age, green bark on young branches (1-5 year old wood)

Transplant Issues: easy to transplant B&B

Management Issues: none of significance

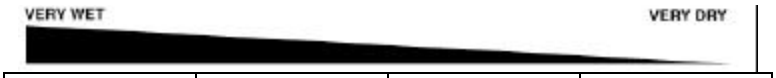
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™

Cultivars: Millstone™ ('Halka', good form, symmetrical, uniform, dense branching, deeper green foliage)**, 'Princeton Upright'** (similar to 'Regent' except narrower, upright form, 25'-35' wide), **Regent®** (fast growing, reportedly straighter trunk, flowers at younger age than species, deeper green foliage, resistance to leaf-chewing insects)



Scientific Name: *Taxodium distichum*
Common Name: Common Baldcypress
Environmental Conditions:

Hardiness Zone: 5a (4 with appropriate selection of genetic material)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: $\leq$ 7.5

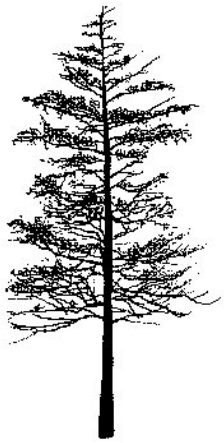
Insect/Disease Factors: none serious or limiting, **'Shawnee Brave'** has mite resistant foliage
Growth Characteristics:

Height: 50'-70'
Width: 20'-40'
Form/Habit: columnar when young, slender pyramidal with age, horizontal branching, often with pendulous branchlets, straight tapered trunk is very short and buttressed at base
Rate: medium

Ornamental Characteristics:

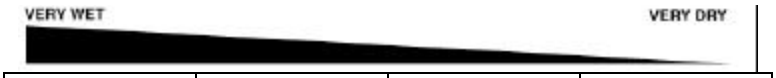
Flower: not ornamentally important
Fruit: 1" globose cones, green to purple when young, brown at maturity
Seasonal Foliage Color: late to leaf out, bright light green in spring, soft green in summer, orange-brown to russet-brown in fall
Bark: attractive, reddish-brown and gray-brown, fibrous

Transplant Issues: difficult to transplant B&B or bare root, slow to recover from transplanting
Management Issues: none of significance
Suggested Uses: wide street tree lawns/pits with pruning or parks due to size, form and low branching habit
Cultivars: limited availability, **'Shawnee Brave'** (zone 5b, narrower, mite resistant foliage, reportedly tolerates high pH soils), **'Monarch of Illinois'** (wider-spreading)



Scientific Name: *Tilia americana*
Common Name: Basswood
Environmental Conditions:

Hardiness Zone: 3a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: sensitive
pH: ≤ 8.2

Insect/Disease Factors: various pests are potentially problematic, although most are rarely serious, foliage feeding insects can damage and almost completely defoliate, scales and linden mites can be serious, susceptible to Japanese beetles

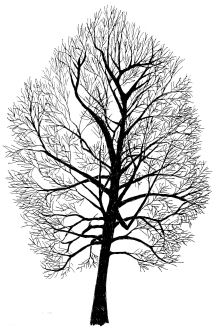
Growth Characteristics:

Height: 60'-80', can grow 100'+
Width: 30'-60'
Form/Habit: pyramidal in youth, oval to rounded with age
Rate: medium to fast

Ornamental Characteristics:

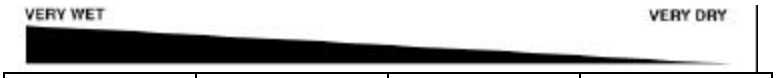
Flower: light yellow, drooping clusters attached to pale greenish-yellow leaf-like bracts, early to mid-summer, very fragrant, attracts bees, flowers before *T. cordata* and *T. tomentosa*
Fruit: not ornamentally important, small nutlets, globose, attached to bracts, late summer
Seasonal Foliage Color: dark green in summer, green-yellow to pale yellow in fall (if any color), can develop unattractive brownish cast in early fall (late season discoloration)
Bark: not ornamentally important, gray to brown with narrow, flat-topped ridges, very tough and fibrous
Other: buds and twigs have potential winter interest, as they vary in color from brown to reddish to greenish and every combination of those colors

Transplant Issues: easy to transplant B&B
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: **'Boulevard'** (narrow pyramidal, yellow fall color), **'Fastigiata'** or **'Pyramidal'** (columnar in youth, pyramidal with age, reaching 25' wide, may be slightly shorter, 50' high, ascending branches, dark green foliage, availability may be limited), **Legend™** (**'Wandell'**, zone 4, distinctly pyramidal, good central leader, excellent branching structure, slightly smaller foliage, thick dark green leaves resistant to late season discoloration, red stem and bud color), **'Lincoln'** (slender, upright, compact form, yellow fall color, listed as having lighter green foliage, also listed as having dark green foliage), **'Redmond'** (*T. americana* x *T. euchlora*, densely pyramidal, larger leaves, buds/stems/foliage all resemble *T. americana* rather than *T. euchlora*, buds reddish, stems are red-green-brown mix, sometimes listed as having lighter green foliage), **'Sentry'** (uniform symmetrical habit, branches silver-gray in youth)



Scientific Name: *Tilia cordata*
Common Name: Littleleaf Linden
Environmental Conditions:

Hardiness Zone: 3b
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

*prolonged drought will lead to leaf scorch

Sun/Shade: full sun
Salt: sensitive
pH: ≤ 8.2

Insect/Disease Factors: various pests are potentially problematic for *Tilia*, although most are rarely serious, aphids (highly susceptible) and Japanese beetles (especially **Greenspire®**) can be serious problems for *T. cordata*

Growth Characteristics:

Height: 50'-70'
Width: 30'-50'
Form/Habit: pyramidal in youth, upright-oval to pyramidal-rounded with age, dense, some cultivars available in multi-stem form (**GreenSpire®)**
Rate: medium to `fast

Ornamental Characteristics:

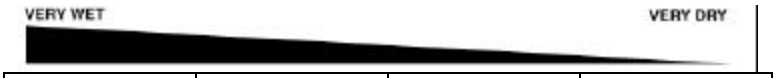
Flower: yellowish, drooping clusters attached to pale greenish-yellow leaf-like bracts, mid-summer, very fragrant, attracts bees, flowers after *T. americana* but before *T. tomentosa*
Fruit: not ornamentally important, small nutlets, globose, attached to bracts, late summer
Seasonal Foliage Color: dark shiny green in summer, yellow-green to yellow in fall
Bark: not ornamentally important, gray-brown, ridged and furrowed on older trunks

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: *many are known, the following are more readily available selections*
Chancellor® (**'Chancole'**, fast growing, narrow in youth, becoming tightly pyramidal with age, 20'-30' wide, symmetrical, upward branching, good branch angles, straight trunk, dense, gold-yellow fall color), **Corinthian®** (**'Corzam'**, pyramidal, compact ,15'-25' wide, straight central leader, uniform limb spacing, straight trunk, foliage smaller, thicker, glossier, and reportedly more blue-green), **Fairview™** (fast growing, evenly spaced branching, thick and leathery foliage, less formal look than other cultivars due to a less dense habit), **'Glenleven'** (reportedly very cold hardy, fast growing, pyramidal to narrow-oval, straight trunk, symmetrical branching, larger leaves, less dense than some other cultivars), **Greenspire®** (**'PNI 6025'**, zone 4, pyramidal to narrow-oval, strong central leader, symmetrical branching habit), **'Olympic'** (zone 4, symmetrical form, broadly pyramidal, better branching), **'Rancho'** (upright-oval, 20'-30' wide, vigorous, smaller leaves, good branch angles, heavy flowerings, very fragrant flower, partially resistant to Japanese beetles), **Shamrock®** (**'Baileyi'**, zone 4, broadly pyramidal, more vigorous and more open habit than Greenspire®, symmetrical branching at an early age)

'Glenleven'

Scientific Name: *Tilia* x *euchlora* (*T. cordata* x *T. dasystyla*)
Common Name: Crimean Linden
Environmental Conditions:

Hardiness Zone: 4
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

*reportedly more drought resistant than *T. cordata*

Sun/Shade: full sun
Salt: sensitive
pH: ≤ 8.2

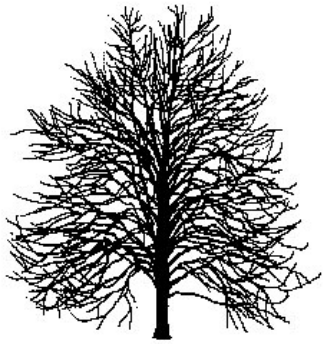
Insect/Disease Factors: various pests are potentially problematic for *Tilia*, although most are rarely serious, *T.* x *euchlora* more resistant to aphids than *T. cordata*
Growth Characteristics:

Height: 40'-60'
Width: 20'-30'
Form/Habit: broadly pyramidal in youth and often with age, sometimes more rounded with age, pendulous lower branches, dense
Rate: medium-fast

Ornamental Characteristics:

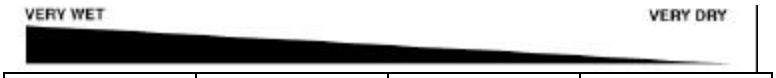
Flower: yellowish, drooping clusters attached to pale greenish-yellow leaf-like bracts, mid-summer, likely very fragrant and attractive to bees
Fruit: not ornamentally important, small nutlets, globose, attached to bracts, late summer
Seasonal Foliage Color: lustrous dark green in summer, green to yellow-green in fall
Bark: not ornamentally important, gray-brown, ridged and furrowed on older trunks
Other: buds and twigs are often more green in color

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: basal suckering on grafted trees can be a maintenance problem, specify 'own roots' when possible
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: 'Laurelhurst' (compact, broadly pyramidal, straight trunk)



Scientific Name: *Tilia tomentosa*
Common Name: Silver Linden
Environmental Conditions:

Hardiness Zone: 5a
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

*tolerates drought better than *T. cordata*

Sun/Shade: full sun
Salt: unknown
pH: ≤ 8.2
Other: tolerates heat better than *T. cordata*

Insect/Disease Factors: various pests are potentially problematic for *Tilia*, although most are rarely serious, aphids can be serious problem for *T. tomentosa*, less susceptible to Japanese beetles than other *Tilia*, **'Sterling Silver'** resistant to Japanese beetles, **'Satin Shadow'** reportedly resistant to Japanese beetles

Growth Characteristics:

Height: 50'-70'
Width: 35'-55'
Form/Habit: pyramidal in youth, pyramidal to upright-oval with age, generally dense and symmetrical
Rate: medium

Ornamental Characteristics:

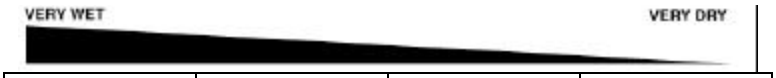
Flower: yellowish, drooping clusters attached to pale greenish-yellow leaf-like bracts, mid-summer, very fragrant, latest flowering *Tilia*
Fruit: not ornamentally important, small nutlets, egg-shaped with a point, attached to bracts, late summer, often light seed crop
Seasonal Foliage Color: shiny dark green above, silvery and pubescent on underside in summer, green-yellow to yellow in fall
Bark: not ornamentally important, smooth light gray, eventually becoming gray-brown, ridged and furrowed on older trunks

Transplant Issues: moderately difficult to transplant B&B or bare root, better success in transplanting bare root in fall, do not attempt to transplant > 2" caliper trees bare root, slower to recover from transplanting than other *Tilia*
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: Green Mountain® ('PNI 6051', fast growing, symmetrical, dense canopy), **Sterling Silver™ ('Wandell'**, fast growing, symmetrical, dense canopy, resistant to Japanese beetles), **Satin Shadow™** ('**Sashazam'**, possibly more cold hardy, symmetrical, reportedly resistant to Japanese beetles)

Sterling Silver™

Scientific Name: *Ulmus americana*
Common Name: American Elm Cultivars
Environmental Conditions:

Hardiness Zone: varies, 3b to 5a (see cultivar listing below)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

Insect/Disease Factors: *all cultivars listed below show moderate to excellent resistance to Dutch elm disease* (**'Valley Forge'** thought to have the highest resistance), although resistance to elm yellows (a fatal disease sometimes known as Phloem Necrosis) and elm leaf beetle (an insect that can cause severe damage in some areas) varies

Cultivar	Elm Yellows	Elm Leaf Beetle
'New Harmony'	resistant	resistant
'Valley Forge'	resistant	resistant
'Delaware #2'	susceptible	unknown
'Princeton'	unknown	resistant
'Washington'	moderately susceptible	unknown

*** 'Liberty'** is highly susceptibility to elm yellows and is not recommended due to variability of resistance to Dutch elm disease

Growth Characteristics:

Height: 60'-80', can grow over 100'
Width: 40'-80'
Form/Habit: vase-shaped
Rate: medium to fast

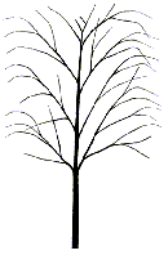
Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous
Fruit: ½" disc-shaped, matures in spring
Seasonal Foliage Color: lustrous green to dark green, often yellow in fall
Bark: dark gray, fissured, with broad, deep, intersecting ridges

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: none of significance
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars:

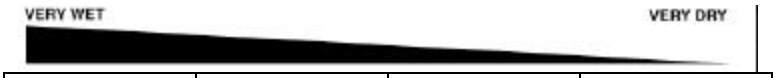
Most promising new cultivars: **'New Harmony'** (zone 5 (4), broadly vase-shaped, more rounded than 'Valley Forge', yellow fall color), **'Valley Forge'** (zone 5, upright arching, vase-shaped, classic American Elm shape, dense, yellow fall color)

Available: **'Delaware #2'** (zone 3b (3a), broadly rounded vase-shaped, sometimes irregular habit, fast growing, bright green foliage), **'Princeton'** (zone 4 (3b), upright vase-shaped, symmetrical, fast growing, leathery dark green foliage, yellow fall color),**'Washington'**(zone 3b, classics vase-shape, glossy foliage)



Scientific Name: *Ulmus* x species
Common Name: Elm Hybrids
Environmental Conditions:

Hardiness Zone: varies, 3b to 5a (see cultivar listing below)
Soil Moisture:



occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
1	2	3	4	5	6	7	8	9	10	11	12

Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

Insect/Disease Factors: all cultivars listed are resistant to Dutch elm disease, resistance to elm yellows (a fatal disease sometimes known as Phloem Necrosis) and elm leaf beetle (an insect that can cause severe damage in some areas) varies, see chart on page 114

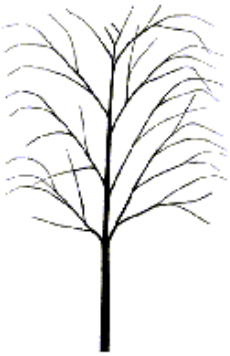
Growth Characteristics:

Height: 50'-70'
Width: 40'-60' typical, can equal height with age
Form/Habit: varies with cultivar, see cultivar chart on following page
Rate: medium to fast, many cultivars are noted as fast growing on cultivar chart on following page

Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous
Fruit: ½" disc-shaped, matures in spring
Seasonal Foliage Color: green to dark green in summer (all cultivars listed as dark green except **Vanguard™** and **Commendation™**), yellow in fall
Bark: gray to brown, ridged or scaly, varies with these hybrids, can be attractive but none considered highly ornamental as *U. parvifolia* species and cultivars except **'Frontier'** (gray-green bark with orange lenticels due to *U. parvifolia* partial parentage)

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root (except **'Frontier'**, which is difficult to transplant bare root)
Management Issues: plants propagated on 'own roots' are preferred, specify when possible
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars: see chart on following page



'Homestead'

Ulmus* x species (Elm Hybrids)*:

Culitvar	Growth Rate and Size (if differs from previous page)	Form/Habit	Foliage (if differs from previous page)
Zone 3			
'Discovery' (possibly 2b)	more compact, 45' high, 35' wide	upright oval to vase-shaped in youth, develops arching vase-shape with age, symmetrical	
'New Horizon'	fast growing	upright, full crown	large leaves, fall color unknown
Zone 4			
'Prospector'	typically shorter, 40' high, 30' wide, fast growing	vase-shaped, American Elm-like but more dense	larger leaves, emerges with orange tint
'Regal'		pyramidal to oval, open, sometimes upright branching, potentially good wide branching angles, strong central leader	not glossy, little fall color
'Sapporo Autumn Gold'	fast growing	conical in youth, potentially vase-shaped and American Elm like, upright and irregular branching, densely branched	emerges with red tint
'Urban' (4a)	fast growing	pyramidal to broadly columnar, strong central leader	
Vanguard™ ('MortonPlainsman')	grows into mid-summer	upright vase-shaped	waxy, glossy, slightly folded
Zone 4 to 5			
Accolade™ ('Morton')	fast growing	vase-shaped, arching, American Elm-like	glossy
Danada Charm™ ('Morton Red Tip')	fast growing	vase-shaped, arching, very American Elm-like	glossy, emerges red
Zone 5			
Commendation™ ('Morton Stalwart')	fast growing	upright oval, symmetrical	larger leaves
'Frontier'	may have slightly smaller stature, fast growing	pyramidal to upright oval when young, develops vase-shape with age	glossy, emerges with reddish tint, red to reddish-purple in fall, long lasting fall color
'Homestead' (5a)		pyramidal to oval, usually becoming arching with age, dense branching when young, symmetrical	dense foliage
'Patriot'		stiffly upright, vase-shaped, may stay narrower	
'Pioneer'	fast growing	broad pyramidal in youth, rounded with age, some branches arching, dense	larger leaves
Triumph™ ('Morton Glossy')		upright oval to vase-shaped, arching, strong branching, symmetrical	glossy

***Ulmus* x species (Elm Hybrids) Disease Resistance:** all listed cultivars are Dutch elm disease resistant

Cultivar	Elm Yellows	Elm Leaf Beetle
'Discovery'	resistant	resistant
'New Horizon'	unknown	moderately susceptible
'Prospector'	resistant	resistant
'Regal'	unknown	susceptible
'Sapporo Autumn Gold'	unknown	susceptible
'Urban'	resistant	very susceptible
Vanguard™ ('Morton Plainsman')	reportedly resistant	moderately resistant
Accolade™ ('Morton')	reportedly resistant	resistant
Danada Charm™ ('Morton Red Tip')	reportedly resistant	unknown but likely resistant
Commendation ™ ('Morton Stalwart')	reportedly resistant	unknown
'Frontier'	tolerant, likely resistant	moderately resistant
'Homestead'	resistant	susceptible
'Patriot'	resistant	resistant
'Pioneer'	resistant	susceptible
Triumph™ ('Morton Glossy')	reportedly resistant	unknown

***Ulmus* x spp (Elm Hybrids) Parentage:**

Accolade™ ('Morton')
(*U. japonica* x *U. wilsoniana*)

Commendation ™ ('Morton Stalwart')
((*U. japonica* x *U. wilsoniana* 'Morton') x (*U. pumila* x *U. carpinifolia*))

Danada Charm™ ('Morton Red Tip')
(*U. japonica* x *U. wilsoniana*)

'Discovery'
(not hybrid, *U. davidiana* var. *japonica*)

'Frontier'
(*U. parvifolia* x *U. carpinifolia*)

'New Horizon'
(*U. japonica* x *U. pumila*)

'Homestead'
(complex, involving *U. pumila*, *U.* x *hollandica*, and *U. carpinifolia*)

'Patriot'
(complex, crossing 'Urban' (complex parentage listed below) with a selection of *U. wilsoniana*),

'Pioneer'
(*U. glabra* x *U. carpinifolia*)

'Prospector'
(not hybrid, *U. wilsoniana*)

'Regal'
(complex, cross 'Commelin' (*U.* x *hollandica* 'Vegata' x *U. carpinifolia* #1) with 'N215' (*U. pumila* x *U. carpinifolia* 'Hoersholmiensis'))

'Sapporo Autumn Gold'
(*U. japonica* x *U. pumila*)

Triumph™ ('Morton Glossy')
((*U. japonica* x *U. wilsoniana* 'Morton') x ((*U. japonica* x *U. pumila* 'Morton Plainsman'))

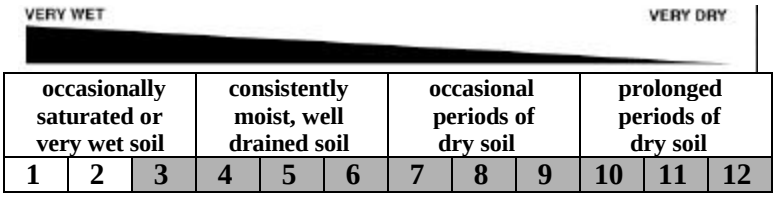
'Urban'
(complex, involving *U.* x *hollandica* 'Vegata', *U. carpinifolia*, and *U. pumila*)

Vanguard™ ('Morton Plainsman')
(*U. japonica* x *U. pumila*)

Scientific Name: *Ulmus parvifolia*
Common Name: Chinese Elm or Lacebark Elm
Environmental Conditions:

Hardiness Zone: 5b

Soil Moisture:



Sun/Shade: full sun

Salt: some observed tolerance

pH: ≤ 8.2

Insect/Disease Factors: species shows reliably good resistance to Dutch elm disease, elm yellows, and elm leaf beetle, as well as Japanese beetle

Growth Characteristics:

Height: 40'-75'

Width: 30'-75'

Form/Habit: variable, rounded or vase-shaped, often with pendulous branchlets, some almost American Elm-like with upright-spreading branches, while others are broader than tall with broad-spreading branches

Rate: medium to fast

Ornamental Characteristics:

Flower: not ornamentally important, inconspicuous, late summer to early fall

Fruit: 1/3" disc-like samara, ripens in fall

Seasonal Foliage Color: lustrous dark green in summer, color varies in fall, yellow to reddish purple

Bark: extremely ornamental, exfoliates and mottles in combinations of gray, green, orange, and brown, often with burnt orange corky lenticles

Transplant Issues: transplant B&B

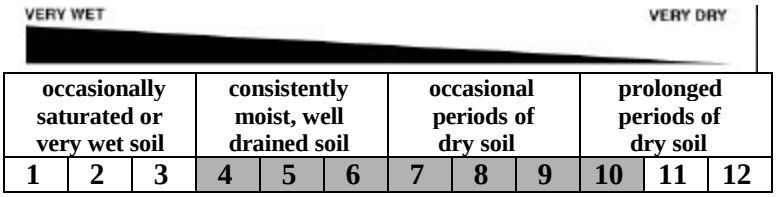
Management Issues: none of significance

Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™

Cultivars: *New cultivars selected for various ornamental characteristics and/or cold hardiness are becoming increasingly available. The following newer cultivars are hardy to Zone 5 and currently available*: **'Dynasty'** (one of the first introductions, hence is more easily available cultivar, upright vase-shaped, 50' high, 45' wide, dull orange to red fall color but bark extremely inferior to following cultivars and often not even considered ornamental), **Allee® ('Emerald Vase' or 'Emer II'**, upright-spreading form, 70' high, 60' wide, dense canopy, trunk irregularly fluted, excellent bark pattern – even on surface roots and 1"-2" diameter branches, bark has burnt orange corky lenticels, subdued yellow fall color), **Athena® ('Emerald Isle' of 'Emer I'**, broad-spreading habit, rounded/globe-shaped, 40' high, 55' wide, dense canopy, excellent bark pattern begins 2' off the ground, bark has burnt orange corky lenticels, leathery foliage, very dark green-almost black-in summer, bronze-brown in fall), **'Ohio'** (moderately vase-shaped, probably 40'-50' high, 35'-45' wide, perhaps larger, appears more loose and open, attractive gray-orange exfoliating bark, smaller leaves, grass green summer foliage, grayish-red fall color, fruit ripens red-purple color), **'Pathfinder'** (vase-shaped, probably 35'-45' high, 30'-40' wide, perhaps larger, sometimes strong central leader, bark likely similar to 'Ohio'–attractive gray-orange exfoliating, yellow-green leaves in summer, grayish-red in fall, fruit ripens red-purple color), **Three cultivars selected for cold hardiness (possibly into zone 4) that may become more available in the near future:* **'Hallelujah'** (fast growing, excellent foliage and bark detail), **'Matthew'** (upright vase-shape, strong branches, bark exfoliates at early age), and **'Zettler'** (strong, upright habit, excellent branching structure)

Scientific Name: *Zelkova serrata*
Common Name: Japanese Zelkova
Environmental Conditions:

Hardiness Zone: 5b
Soil Moisture:



Sun/Shade: full sun
Salt: some observed tolerance
pH: ≤ 8.2

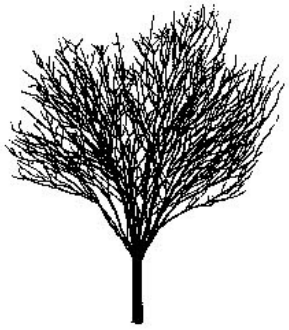
Insect/Disease Factors: none serious or limiting
Growth Characteristics:

Height: 50'-70' (can reach 120' in wild)
Width: 40'-60'
Form/Habit: vase-shaped, generally upright arching branches, short trunked
Rate: medium, possibly fast in youth

Ornamental Characteristics:

Flower: not ornamentally important, usually present as leaves are emerging
Fruit: not ornamentally important, ripens in fall
Seasonal Foliage Color: medium or dark green in summer, variable color in fall, often russet-yellow, but full range possible - brown/yellow/orange/red/purple
Bark: extremely ornamental, reddish brown and cherry-like in youth, exfoliates and mottles with age in oranges, grays and browns

Transplant Issues: easy to transplant B&B or ≤ 2" caliper bare root
Management Issues: narrow crotch angles and poor branch attachments which may give rise to splitting and form damage when older
Suggested Uses: narrow or wide street tree lawns/pits, parks, suitable for CU-Structural Soil™
Cultivars:
Common: *following three are fast growing selections ('Halka' is fastest, followed by Green Vase®, then Village Green™),* **Green Vase®** (60'-70' high, upright vase-shaped, orange-brown to bronze-red fall color), **'Halka'** (60'-70' high, graceful aching branches, often better branch attachment, most American Elm-like, summer foliage color not dark green like other cultivars, yellowish fall color), **Village Green™** (50'-60' high, broadly vase-shaped, width equal to height, dark green foliage, rusty red fall color)
Available: **'Green Veil'** (listed as zone 4, dark green leaves, branchlets somewhat pendulous, not as fast growing as most common three culitvars listed above), **'Illinois Hardy'** (possibly more cold hardy, zone 5a)**, 'Musashino'** (narrower, upright form, 20' wide, yellow fall color), **'Spring Grove'** (dark green foliage, wine red fall color)



Green Vase®

TREES GROUPED BY SITE OR PLANTING CONDITIONS

I. SOIL MOISTURE AND pH CHART

BOTANICAL NAME	COMMON NAME	VERY WET → VERY DRY											
		occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
		1	2	3	4	5	6	7	8	9	10	11	12
pH ≤ 7.0													
Acer rubrum	Red Maple												
	Red Sunset®, 'Bowhall'	1	2	3	4	5	6	7	8	9	10	11	12
	'Autumn Flame', October Glory®	1	2	3	4	5	6	7	8	9	10	11	12
	Northwood®, 'Karpick'	1	2	3	4	5	6	7	8	9	10	11	12
Betula nigra 'Cully' & 'BNMTF'	Heritage® & Dura-Heat™ River Birch	1	2	3	4	5	6	7	8	9	10	11	12
Quercus palustris	Pin Oak	1	2	3	4	5	6	7	8	9	10	11	12
pH ≤ 7.5													
Acer buergerianum	Trident Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer saccharum	Sugar Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer x *freemanii*	Freeman Maple	1	2	3	4	5	6	7	8	9	10	11	12
Amelanchier species	Serviceberry Species and Hybrids	1	2	3	4	5	6	7	8	9	10	11	12
Betula populifolia 'Whitespire Sr.'	Whitespire Sr. Gray Birch	1	2	3	4	5	6	7	8	9	10	11	12
Carpinus caroliniana	Ironwood	1	2	3	4	5	6	7	8	9	10	11	12
Celtis laevigata	Sugar Hackberry	1	2	3	4	5	6	7	8	9	10	11	12
Liquidambar styraciflua	American Sweetgum	1	2	3	4	5	6	7	8	9	10	11	12
Nyssa sylvatica	Black Tupelo	1	2	3	4	5	6	7	8	9	10	11	12
Prunus 'Accolade'	Accolade Flowering Cherry	1	2	3	4	5	6	7	8	9	10	11	12
Prunus 'Snow Goose'	Snow Goose Cherry	1	2	3	4	5	6	7	8	9	10	11	12
Prunus sargentii	Sargent Cherry	1	2	3	4	5	6	7	8	9	10	11	12
Prunus virginiana 'Canada Red Select'	Canada Red Chokecherry	1	2	3	4	5	6	7	8	9	10	11	12
Quercus acutissima	Sawtooth Oak	1	2	3	4	5	6	7	8	9	10	11	12
Quercus bicolor	Swamp White Oak	1	2	3	4	5	6	7	8	9	10	11	12
Quercus coccinea	Scarlet Oak	1	2	3	4	5	6	7	8	9	10	11	12
Quercus imbricaria	Shingle Oak	1	2	3	4	5	6	7	8	9	10	11	12
Quercus phellos	Willow Oak	1	2	3	4	5	6	7	8	9	10	11	12
Quercus rubra	Northern Red Oak	1	2	3	4	5	6	7	8	9	10	11	12
Taxodium distichum	Common Baldcypress	1	2	3	4	5	6	7	8	9	10	11	12
pH ≤ 8.2													
Acer campestre	Hedge Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer miyabei	Miyabei Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer platanoides	Norway Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer pseudoplatanus	Sycamore Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer tataricum	Tartarian Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer tataricum ssp. *ginnala*	Amur Maple	1	2	3	4	5	6	7	8	9	10	11	12
Acer truncatum	Shantung Maple	1	2	3	4	5	6	7	8	9	10	11	12

BOTANICAL NAME	**COMMON NAME**	VERY WET								VERY DRY			
		occasionally saturated or very wet soil			**consistently moist, well drained soil**			**occasional periods of dry soil**			**prolonged periods of dry soil**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
pH ≤ 8.2 (continued)													
Aesculus x *carnea*	Red Horsechestnut	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Alnus glutinosa	European Alder	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Carpinus betulus	European Hornbeam	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Catalpa speciosa	Northern Catalpa	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Celtis occidentalis	Common Hackberry	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cercidiphyllum japonicum	Katsura Tree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cercis canadensis	Eastern Redbud	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cladrastis kentukea	Yellowwood	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cornus mas	Corneliancherry Dogwood	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Corylus colurna	Turkish Filbert	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cotinus obovatus	American Smoketree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Crataegus crus-galli var. *inermis*	Thornless Cockspur Hawthorn	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Crataegus phaenopyrum	Washington Hawthorn	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Crataegus punctata var. *inermis* 'Ohio Pioneer'	Ohio Pioneer Dotted Hawthorn	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Crataegus viridis 'Winter King'	Winter King Hawthorn	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Eucommia ulmoides	Hardy Rubber Tree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Fraxinus americana	White Ash	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Fraxinus excelsior	European Ash	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Fraxinus 'Northen Gem' and 'Northern Treasure'	Northen Gem Ash and Northern Treasure Ash	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Fraxinus pennsylvanica	Green Ash	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Ginkgo biloba	Ginkgo	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Gleditsia triacanthos var. *inermis*	Thornless Common Honeylocust	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Gymnocladus dioicus	Kentucky Coffeetree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Koelreuteria paniculata	Goldenraintree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Liriodendron tulipifera	Tuliptree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Maclura pomifera var. *inermis*	Osage Orange	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Malus species	Crabapple	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Metasequoia glyptostroboides	Dawn Redwood	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Ostrya virginiana	American Hophornbeam	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Parrotia persica	Persian Parrotia	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Phellodendron amurense	Amur Corktree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Platanus x *acerifolia*	London Planetree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Pyrus betulaefolia	Birchleaf Pear	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Pyrus calleryana	Callery Pear	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Pyrus fauriei 'Westwood'	Korean Sun™ Pear	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Pyrus ussuriensis	Ussurian Pear	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Quercus macrocarpa	Bur Oak	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Quercus muehlenbergii	Chinkapin Oak	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Quercus robur	English Oak	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Quercus shumardii	Schumard Oak	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

BOTANICAL NAME	COMMON NAME	VERY WET → VERY DRY											
		occasionally saturated or very wet soil			consistently moist, well drained soil			occasional periods of dry soil			prolonged periods of dry soil		
		1	2	3	4	5	6	7	8	9	10	11	12
pH ≤ 8.2 (continued)													
Robinia pseudoacacia	Black Locust	1	2	3	4	5	6	7	8	9	10	11	12
Sorbus alnifolia	Korean Mountainash	1	2	3	4	5	6	7	8	9	10	11	12
Sorbus intermedia	Swedish Mountainash	1	2	3	4	5	6	7	8	9	10	11	12
Sorbus x *hybrida* and *Sorbus* x *thuringiaca*	Oak-Leaf Mountainash	1	2	3	4	5	6	7	8	9	10	11	12
Styphnolobium japonicum (Sophora japonica)	Japanese Pagodatree	1	2	3	4	5	6	7	8	9	10	11	12
Syringa reticulata	Japanese Tree Lilac	1	2	3	4	5	6	7	8	9	10	11	12
Tilia americana	Basswood	1	2	3	4	5	6	7	8	9	10	11	12
Tilia cordata	Littleleaf Linden	1	2	3	4	5	6	7	8	9	10	11	12
Tilia x *euchlora*	Crimean Linden	1	2	3	4	5	6	7	8	9	10	11	12
Tilia tomentosa	Silver Linden	1	2	3	4	5	6	7	8	9	10	11	12
Ulmus americana	American Elm	1	2	3	4	5	6	7	8	9	10	11	12
Ulmus parvifolia	Chinese Elm	1	2	3	4	5	6	7	8	9	10	11	12
Ulmus x species	Elm Hybrids	1	2	3	4	5	6	7	8	9	10	11	12
Viburnum sieboldii	Siebold Viburnum	1	2	3	4	5	6	7	8	9	10	11	12
Zelkova serrata	Japanese Zelkova	1	2	3	4	5	6	7	8	9	10	11	12

II. TREES THAT TOLERATE PARTIAL SHADE

BOTANICAL NAME	COMMON NAME
Acer miyabei	Miyabei Maple
+Acer platanoides	Norway Maple
Acer psuedoplatanus	Sycamore Maple
Acer saccharum	Sugar Maple
Acer tataricum	Tartarian Maple
Acer tataricum ssp. *ginnala*	Amur Maple
Alnus glutinosa	European Alder
Amelanchier species	Serviceberry Species and Hybrids
Betula nigra 'Cully' & 'BNMTF'	Heritage®& Dura-Heat™ River Birch
**Carpinus caroliniana*	Ironwood
Celtis laevigata	Sugar Hackberry
Celtis occidentalis	Common Hackberry
Cercidiphyllum japonicum	Katsura Tree
Cercis canadensis	Eastern Redbud
Cornus mas	Corneliancherry Dogwood
Ostrya virginiana	American Hophornbeam
Parrotia persica	Persian Parrotia
+Robinia pseudoacacia	Black Locust
Sorbus alnifolia	Korean Mountainash
Sorbus x *hybrida* and *Sorbus* x *thuringiaca*	Oak-Leaf Mountainash
Syringa reticulata	Japanese Tree Lilac
Viburnum sieboldii	Siebold Viburnum

* prefers partial shade
+ tolerates full shade

III. TREES OBSERVED TO HAVE SOME SALT TOLERANCE

BOTANICAL NAME	**COMMON NAME**
Acer buergerianum	Trident Maple
Acer campestre	Hedge Maple
Acer platanoides	Norway Maple
Acer pseudoplatanus	Sycamore Maple
Acer tataricum	Tartarian Maple
Acer tataricum ssp. *ginnala*	Amur Maple
Alnus glutinosa	European Alder
Cercis canadensis	Eastern Redbud
Cornus mas	Corneliancherry Dogwood
Crataegus crus-galli var. *inermis*	Thornless Cockspur Hawthorn
Crataegus phaenopyrum	Washington Hawthorn
Crataegus punctata var. *inermis* 'Ohio Poineer'	Ohio Pioneer Dotted Hawthorn
Crataegus viridis 'Winter King'	'Winter King' Hawthorn
Fraxinus americana	White Ash
Fraxinus excelsior	European Ash
Fraxinus pennsylvanica	Green Ash
Ginkgo biloba	Ginkgo
Gleditsia triacanthos var. *inermis*	Thornless Common Honeylocust
Koelreuteria paniculata	Goldenraintree
Maclura pomifera var. *inermis*	Osage Orange
Malus species	Crabapple
Nyssa sylvatica	Black Tupelo
Platanus x *acerifolia*	London Planetree
Prunus 'Accolade'	Accolade Flowering Cherry
Prunus sargentii	Sargent Cherry
Pyrus calleryana	Callery Pear
Quercus acutissima	Sawtooth Oak
Quercus robur	English Oak
Quercus rubra	Northern Red Oak
Robinia pseudoacacia	Black Locust
Styphnolobium japonicum (Sophora japonica)	Japanese Pagodatree
Syringa reticulata	Japanese Tree Lilac
Taxodium distichum	Common Baldcypress
Ulmus americana	American Elm
Ulmus parvifolia	Chinese Elm
Ulmus x species	Elm Hybrids
Zelkova serrata	Japanese Zelkova

IV. TREES SENSITIVE TO SALT

BOTANICAL NAME	**COMMON NAME**
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Amelanchier species	Serviceberry Species and Hybrids
Carpinus betulus	European Hornbeam
Carpinus caroliniana	Ironwood
Cercidiphyllum japonicum	Katsura Tree
Liriodendron tulipifera	Tuliptree
Ostrya virginiana	American Hophornbeam
Quercus palustris	Pin Oak
Tilia americana	Basswood
Tilia cordata	Littleleaf Linden
Tilia x *euchlora*	Crimean Linden

V. TREES SUITABLE FOR USE IN CU-STRUCTURAL SOIL™

BOTANICAL NAME	**COMMON NAME**
Acer campestre	Hedge Maple
Acer miyabei	Miyabei Maple
Acer platanoides	Norway Maple
Acer pseudoplatanus	Sycamore Maple
Acer truncatum	Shantung Maple
Carpinus betulus	European Hornbeam
Catalpa speciosa	Northern Catalpa
Celtis occidentalis	Common Hackberry
Cercis canadensis	Eastern Redbud
Cornus mas	Corneliancherry Dogwood
Corylus colurna	Turkish Filbert
Crataegus crus-galli var. *inermis*	Thornless Cockspur Hawthorn
Crataegus phaenopyrum	Washington Hawthorn
Crataegus punctata var. *inermis* 'Ohio Pioneer'	Ohio Pioneer Dotted Hawthorn
Crataegus viridis 'Winter King'	Winter King Hawthorn
Eucommia ulmoides	Hardy Rubber Tree
Fraxinus americana	White Ash
Fraxinus excelsior	European Ash
Fraxinus 'Northen Gem' and 'Northern Treasure'	Northen Gem Ash and Northern Treasure Ash
Fraxinus pennsylvanica	Green Ash
Ginkgo biloba	Ginkgo
Gleditsia triacanthos var. *inermis*	Thornless Common Honeylocust
Gymnocladus dioicus	Kentucky Coffeetree
Koelreuteria paniculata	Goldenraintree
Maclura pomifera var. *inermis*	Osage Orange
Malus species	Crabapple
Parrotia persica	Persian Parrotia
Phellodendron amurense	Amur Corktree
Platanus x *acerifolia*	London Planetree
Pyrus betulaefolia	Birchleaf Pear
Pyrus calleryana	Callery Pear
Pyrus fauriei 'Westwood'	Korean Sun™ Pear
Pryus ussuriensis	Ussurian Pear
Quercus macrocarpa	Bur Oak
Quercus muehlenbergii	Chinkapin Oak
Quercus robur	English Oak
Robinia pseudoacacia	Black Locust
Sorbus alnifolia	Korean Mountainash
Sorbus intermedia	Swedish Mountainash
Sorbus x *hybrida* and *Sorbus* x *thuringiaca*	Oak-Leaf Mountainash
Styphnolobium japonicum (*Sophora japonica*)	Japanese Pagodatree
Syringa reticulata	Japanese Tree Lilac
Tilia americana	Basswood
Tilia cordata	Littleleaf Linden
Tilia x *euchlora*	Crimean Linden
Tilia tomentosa	Silver Linden
Ulmus americana	American Elm
Ulmus parvifolia	Chinese Elm
Ulmus x species	Elm Hybrids
Zelkova serrata	Japanese Zelkova

VI. TREES EASY TO TRANSPLANT ≤ 2" CALIPER BARE ROOT

BOTANICAL NAME	**COMMON NAME**
Acer campestre	Hedge Maple
Acer x *freemanii*	Freeman Maple
Acer miyabei	Miyabei Maple
Acer tartaricum	Tartaricum Maple
Acer tartaricum ssp. *ginnala*	Amur Maple
Acer platanoides	Norway Maple
Acer pseudoplatanus	Sycamore maple
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Acer truncatum	Shantung Maple
Aesculus x *carnea*	Red Horsechestnut
Amelanchier species	Serviceberry Species and Hybrids
Catalpa speciosa	Northen Catalpa
Cercidiphyllum japonicum	Katsura Tree
Cladrastis kentukea	Yellowwood
Cornus mas	Corneliancherry Dogwood
Fraxinus americana	White Ash
Fraxinus excelsior	European Ash
Fraxinus pennsylvanica	Green Ash
Gleditsia triacanthos var. *inermis*	Thornless Common Honeylocust
Gymnocladus dioicus	Kentucky Coffeetree
Koelreuteria paniculata	Goldenraintree
Malus species	Crabapple
Parrotia persica	Persian Parrotia
Phellodendron amurense	Amur Corktree
Platanus x *acerifolia*	London Planetree
Prunus 'Accolade'	Accolade Flowering Cherry
Prunus sargentii	Sargent Cherry
Prunus virginiana 'Canada Red Select'	Cananda Red Chokecherry
Pryus calleryana	Callery Pear
Pyrus betulaefolia	Birchleaf Pear
Pyrus fauriei 'Westwood'	Korean Sun™ Pear
Pyrus ussuriensis	Ussarian Pear
Quercus bicolor	Swamp White Oak
Robinia pseudoacacia cultivars: 'Purple Robe,' 'Prymidalis,' 'Globosum,' 'Bessoniana'	Black Locust
Sorbus alnifolia	Korean Mountainash
Sorbus intermedia	Swedish Mountainash
Sorbus x *hybrida* and *Sorbus* x *thuringiaca*	Oak-Leaf Mountainash
Syringa reticulata	Japanese Tree Lilac
Tilia cordata	Littleleaf Linden
Tilia x *euchlora*	Crimean Linden
Ulmus americana	American Elm
Ulmus x species, except 'Frontier'	Elm Hybrids
Viburnum sieboldii	Siebold Viburnum
Zelkova serrata	Japanese Zelkova

VI. TREES MODERATELY DIFFICULT TO TRANSPLANT BARE ROOT

(Note: with below species we have better success transplanting in fall and do not attempt to transplant > 2" caliper trees bare root)

BOTANICAL NAME	**COMMON NAME**
Alnus glutinosa	European Alder
Betula spp.	Birch Species
Celtis laevigata	Sugar Hackberry
Celtis occcidentalis	Common Hackberry
Cercis canadensis	Eastern Redbud
Crataegus crus-galli var. *inermis*	Thornless Cockspur Hawthorn
Crataegus viridis 'Winter King'	'Winter King' Hawthorn
Quercus palustris	Pin Oak
Quercus robur	English Oak
Quercus rubra	Nothern Red Oak
Tilia tomentosa	Silver Linden

VIII. TREES DIFFICULT TO TRANSPLANT BARE ROOT

BOTANICAL NAME	**COMMON NAME**
Carpinus betulus	European Hornbeam
Carpinus caroliniana	Ironwood
Corylus colurna	Turkish Filbert
Cotinus obovatus	American Smoketree
Crataegus phaenopyrum	Washington Hawthorn
Ginkgo biloba	Ginkgo
Liriodendron tulipifera	Tuliptree
Ostrya virginiana	American Hophornbeam
Quercus coccinea	Scarlet Oak
Quercus imbricaria	Shingle Oak
Quercus macrocarpa	Bur Oak
Quercus muehlenbergii	Chinkapin Oak
Taxodium distichum	Common Baldcypress
Ulmus 'Fontier'	Frontier Elm

TRANSPLANTING GUIDE

Planting guide covers:

Selecting high-quality nursery trees
Handling, transporting and storing nursery trees
Transplanting ball and burlap, container and bare root trees
Post-planting maintenance

1. Selecting high-quality nursery trees

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.

a. *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.

b. *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.

c. 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.

2. Handling, transporting and storing nursery trees

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).

a. ***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.

b. ***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.

c. ***Storing Trees 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.

3. Transplanting ball and burlap, container and bare root trees

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.

a. ***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. If compacted, add at least 30% organic matter to the entire site - not just within the individual hole.
3. Avoid planting when the soil is very moist because wet soil has a tendency to glaze and become compacted.

b. ***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.

c. ***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 1/3 rd 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.

d. ***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 preventing the desiccation of the roots in transit between the nursery and the planting site. The slurry creates a reservoir of water that helps the roots avoid desiccation.
2. If you must store bare root trees for a few days before planting, keep the them in a cool, shaded location.
3. If root ends appear jagged or split, cut them cleanly with a sterilized pair of pruning shears.
4. When backfilling, be sure that you fill all air spaces with soil—avoid large pockets of air which inhibit root growth.
5. Stake if necessary and water in well.

***For a complete description of bare root transplanting contact the Urban Horticulture Institute to receive the *Creating the Urban Forest: The Bare Root Method* booklet and/or video. The booklet is available on line at the UHI website: <http://www.hort.cornell.edu/uhi>**

e. ***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. There should not be any mulch touching 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 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.

4. Post-planting Maintenance

a. ***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.

b. ***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 a slotted plastic pipe in the hole and fill the pipe with gravel. Cover the top of the pipe with geotextile fabric.