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The Seed

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PLAINS-PROVEN PLANTS TO KNOW AND GROW

The Value of Large Trees

Justin Evertson

Not that long ago most Nebraska communities were full of large American elms. Their tall, arching habit, fast growth and adaptability to a wide range of soil conditions made them a popular choice for planting in towns from Falls City to Chadron and all points in between. Because of its wide-spreading habit, American elm was especially popular for planting along streets. Often the canopies of individual trees met over the middle of the street, creating a ceiling of green that would sometimes stretch for blocks at a time. Unfortunately Dutch elm disease raced across the state in the 1960s and 70s and, in what now seems like the blink of an eye, the elms were gone. And they have been sorely missed.

Although the benefits weren't completely understood at the time, those who planted the elms knew large trees were important to a community. Today, thanks to research from across the country, we can now quantify economically many of the benefits that large trees provide. For example, properly placed and well-cared for trees can increase property values by 10 percent or more while reducing energy costs by up to 15 percent. Other measurable benefits from trees include cleaner air, reduced atmospheric CO₂, better-managed stormwater, extended life of streets, more attractive communities and better human health and well-being. When added together, the benefits of large-stature trees can exceed \$65/tree/year*.

Of course people also benefit directly from trees through the mental and physical comforts they provide. The coolness of the shade on a hot summer day; the sounds of rustling leaves and singing birds; a squirrel flying effortlessly through the branches; the wondrous fragrance of linden blossoms in late spring; the colorful change of leaves in autumn; and the magic of frosted branches on a winter morning...

are just some of the ways we relate directly to trees. These physical and mental comforts are so uplifting that many people develop a very strong spiritual connection to trees. What else explains people who have climbed or chained themselves to important trees to prevent their destruction?

The Big Tree Disconnect

Because we now know how truly valuable large-growing trees are, people and communities must be doing all they can to properly plant and care for them. Right? Wrong!! In fact, according to research by the Nebraska Forest Service, the amount of tree canopy cover provided by large trees in most Nebraska communities has declined significantly since the days of the American elm. When the elms died, many were never replaced. And where replanting did occur, smaller-growing trees—selected primarily for spring flowers or fall color—were often the choice for planting. This trend toward smaller trees has now been broadly referred to as the “dwarfing of the community forest.”

Another disturbing problem facing community forests is the lack of species diversity. If any lesson should have been learned in the wake of Dutch elm disease, it is that a broader diversity of tree species is vital to the health of a



Large trees frame roads in Nebraska City's Steinhart Park.

community's tree resource. Having a wider variety of species greatly reduces the risk of a massive die-off of trees when the next disease or insect comes along. Incredibly, the Dutch elm disease lesson was somehow forgotten and once again a single species of shade tree, this time green ash, has come to dominate

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A Few Big Trees for the Future

Bob Henrickson

One of the benefits of working for the Nebraska Statewide Arboretum (NSA) is the opportunity to visit its network of arboretum sites, parks, historic properties and other public landscapes that spans the entire state. Most of the landscapes that make up the Arboretum are not extensive landscapes but local arboretums and parks where an impressive variety of trees has been assembled. I have visited most of the Arboretum sites over the years and I learn something new every time.

By definition an arboretum is a place where trees are grown for the purpose of education, and what better place to become familiar with new tree selections or alternatives than a local arboretum? People want to plant trees they are familiar with and have seen in the landscape. They also want to be assured that they will grow under regional conditions. A local arboretum is the perfect place to observe and learn about plants they might not be familiar with.

Below is a list of some of the wonderful trees I've observed or grown. Generally they remain confined to arboretums and parks, but in my opinion they have a lot of potential and have proven they should be planted more. These trees have stood the test of time. It's time to get them out of the arboretum and into our home landscapes.



Forest Lawn Cemetery in Omaha is home to many stately trees, including this large tuliptree.

Tuliptree *Liriodendron tulipifera*

Native to the eastern half of the U.S., the tuliptree is a stately tree for large spaces. The leaves are waxy and smooth, retaining a clean appearance through the summer and turning bright yellow in fall. The flowers are the size and shape of garden tulips, blooming in May after the first leaves have expanded. The beautiful two-toned orange-yellow petals are often

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From top: Gary Zimmer, Curator of Gilman Park Arboretum in Pierce and Kristina Jensen, NSA Nursery Technician, stand next to a widespread Amur corktree (*Phellodendron amurense*) at the Morton Arboretum near Chicago. NSA volunteer Bob Vogel with the Nebraska state champion bitternut hickory in Auburn. Close-up of tuliptree blossom. Early spring catkins of Turkish filbert. Overcup oak acorn.

A Few Big Trees continued from cover

hidden by the foliage and are best viewed from a two-story window. There are beautiful trees growing on the campuses at the University of Nebraska in Lincoln (UNL) and at Midland Lutheran College in Fremont. The Nebraska champion is located in Oakland, a big, impressive tree with a 4' diameter trunk. Another large specimen is located in a church courtyard in Humphrey, Nebraska. This tree has performed well in the eastern half of the state and deserves to be planted more.

Amur corktree

Phellodendron amurense

This handsome medium-sized tree has deep green, shiny leaves that remain clean all summer. The bark on old trunks is ridged and furrowed, forming a beautiful cork-like pattern. One of the best features of this tree is the broad-spreading habit, open crown and horizontal branch arrangements. This tree is native to the Amur River region in China, the same area as Amur maple and Amur chokecherry. Beautiful specimens of corktree are growing at UNL, Peru State College, Steyer Park in Blair and Memorial Park in Tekamah. An Amur corktree has been performing well in the Kimball arboretum in western Nebraska for over 12 years. The male selections 'Macho' and 'His Majesty' are fruitless and noted for their thick, leathery leaves and spreading growth habit.

Overcup Oak

Quercus lyrata

Overcup oak is the southern counterpart to swamp white oak, native from the southeastern U.S. west to Missouri and Oklahoma. This is one of the most flood-tolerant oaks and it grows naturally on poorly-drained, heavy clay soils. The acorn is almost fully enclosed by the cup and falls from the tree intact. The cups provide flotation and help to disperse the seeds under flooded conditions. The dark green, leathery leaves turn dull gold in fall. We have collected seeds from mature specimens of overcup oak on the grounds of St. Joseph's Catholic Church in Auburn, Nebraska. Seedling progeny of these trees are being evaluated by participants in our Research Consortium program and nurseries are beginning to carry good-sized trees. A healthy 50' tree is thriving in a Lincoln neighborhood and in the arboretum oak collection at the Lincoln Regional Center Arboretum. Michael Dirr feels this tree could become an important landscape tree, saying he "does not remember an unworthy specimen. With its adaptability to wet soils it may be adapted to similar urban conditions."

Burgambel Oak

Quercus macrocarpa x gambelii

The bur oak, *Quercus macrocarpa*, is one of our most variable oak species and is prone to hybridize with other white oaks. Many intermediate forms show genetic influences from swamp white oak, white oak and others, including gambel oak. Natural hybrid populations of bur oak and gambel oak (*Quercus gambelii*) can be found in Colorado and Wyoming. The burgambel oak hybrid is one of the best for acorn production and develops a compact, bushy crown to 40' high. If you are limited in space but still want the durability and adaptability of a bur oak, then plant burgambel oak. This tree has a lot of potential for harsh, dry landscapes throughout Nebraska, but especially in the western half of the state. It makes its best growth in dry, sandy well-drained sites. Several young trees are thriving on the UNL campus.

Turkish Filbert

Corylus colurna

This uncommon tree is handsome, sturdy and trouble-free. The deep green, toothed foliage remains clean throughout the summer and seems to be free of insect and disease problems. The gray-brown bark is heavily textured and the branches develop a very attractive formal outline. In early spring the clusters of long male catkins dangle from the bare branches like tarantula spiders. Though native to Europe and Asia, it seems to thrive in Nebraska and a number of outstanding specimens can be seen at UNL and at the Nebraska Game and Parks Commission headquarters in Lincoln. Out west, a young tree is thriving in Lexington at the Dawson County fairgrounds, but the best specimen in the state is a 50' beauty at the Glen Viehmeyer Arboretum in North Platte. This tree is underused and can be difficult to locate in commerce, but it's worth the hunt!

Bitternut Hickory

Carya cordiformis

This relatively fast-growing, beautiful tree is native to southeast Nebraska along the Missouri bluffs and along creeks and rivers as far west as Wahoo and Beatrice. In rich, woodland sites the bitternuts typically develop several primary vertical limbs, forming an arching shape. Their tight, relatively smooth bark and bright yellow fall color are reason enough to plant this tree. In spring, the long male catkins "hang like tinsel from the branches and are visible below the leaves" (Guy Sternberg, *Native Trees for North American Landscapes*).

Hickories develop long taproots and can be difficult to transplant, however with today's air-pruning pots and root-restricting fabrics, the root systems produce a branching root system. Our native seed source should yield a more adaptable tree for areas throughout eastern Nebraska.

The state champion at Wyuka cemetery in Nebraska City is an impressive specimen and an 80' tree has thrived for decades less than a block away from one of Lincoln's busiest streets. A grove of fine, young bitternuts can be seen at UNL's Cather Garden.

Some of these trees may not be readily available from local nurseries but that's largely a matter of supply and demand. When people become familiar with these trees, I'm confident they'll start asking for them, and when customers start asking for them, nurseries will start carrying them.

This is a small example of the incredible variety of trees thriving in Nebraska. If you haven't had the opportunity to see these trees, you can count on Nebraska Statewide Arboretum affiliates to introduce them to you. For more information about where to see them, call 402/472-2971 or visit arboretum.unl.edu/affiliate. These trees may be rare in our home landscapes right now, but they won't be once the word gets out!

For more information on recommended trees:

arboretum.unl.edu/plantinfo

The Truth about Roots

Eric Berg, Nebraska Forest Service
Bob Henrickson, Nebraska Statewide Arboretum

It's hard to overemphasize the importance of a tree's root system in maintaining a healthy tree and, ultimately, a healthy community forest. At the simplest level, the main functions of tree roots are to support the tree and to take up the water and minerals essential to overall plant vigor and health.

Probably because they are unseen, there are many misconceptions and myths about this invisible, underappreciated and essential part of the tree.

Myth: Tree roots are tough and woody.

Reality: The majority of root biomass is made up of very fine feeder roots, typically averaging only 1/16" in diameter, which are responsible for water and mineral uptake. Structural roots located near the trunk help support the tree and are typically large and strong, but feeder roots represent the major portion of the root system's surface area. The root system of a tree can be thought of as a permanent, structural woody frame with "disposable" fine roots that may last for only one season due to poor soil growing conditions, drought or freezing temperatures. In the urban environment, these roots are also very susceptible to compaction, over-watering, construction damage, water pollution and soil contamination. Trees can lose as much as 95 percent of their root system in being transplanted and therefore spend a majority of energy reserves to re-establish them.

Myth: Tree roots grow deep into the soil.

Reality: The majority of tree roots are found in the top 18" of soil, and typically over half of a tree's roots are in the top 6" of soil. Tree roots require oxygen for survival. They will occupy and grow in areas favorable for survival, with good aeration and available moisture and nutrients. These types of conditions are easily created with proper mulching. While there are many instances where a given species might send roots deep into the soil, the vast majority are typically just below the soil surface—deep enough for reliable moisture, yet shallow enough for good oxygen levels. Poor soil aeration, typical of compacted soils, is one of the most limiting factors for root growth in the urban environment. When compaction is coupled with over-watering, there is very little pore space left for oxygen and, as a result, roots slowly suffocate and die.

Myth: Tree roots exist only under the tree canopy.

Reality: Tree roots typically have very extensive root systems growing well beyond the canopy of the crown. In forested or natural environments, roots may be found growing two to four times beyond the diameter of the tree canopy, and with drought-tolerant species such as oak, the spread can be up to six times the canopy width. Roots do not mirror what you see aboveground. To visualize this, imagine a tree represented as a wine glass connected to a wide flat plate. The glass and stem represent the canopy and trunk and the plate represents the root system extending well beyond the canopy of the tree. This is very important to consider when dealing with potential construction damage or

chemical applications. Soil sterilants and materials containing Dicamba for broadleaf control should not be used around trees as these chemicals are persistent and active in the soil and will severely damage tree root systems over time.

Healthy root systems result in healthy trees, whether they're in your backyard, in your community or in natural forested areas. By better understanding some of the basic biological realities of tree roots, you can better maintain and protect them. So the next time you do construction work, apply herbicide or drive across that seemingly wide expanse of fescue, stop and consider the trees around you and the fragile but critical roots beneath your feet.

Top: The major portion of a tree's root system is made up of small feeder roots. Because they are fine-textured and close to the surface, they are easily damaged by compaction, construction damage and chemical applications.

Bottom: Circling and girdled roots are a common problem in container-grown trees. (Photos courtesy of Eric Berg)



An Ode to Hackberry

Justin Evertson

Growing trees in Nebraska can be a risky proposition. If wind, hail, ice storms, tornadoes, droughts, hot summers and cold winters don't kill a tree, insects, diseases and people often seem ready to finish the job. Thank goodness for hackberry (*Celtis occidentalis*). This tough-as-nails cousin to the elm has proven its worth in yards, parks, farmsteads and shelterbelts across the state for generations.

Hackberry possesses many positive attributes that make a good tree for the Great Plains. Its broad, arching growth habit makes it an ideal species for street side plantings; its tough character makes it very useful in parks and other public spaces; its distinctive warty bark and clean branching gives it a unique natural character; it is native to the region and thus uniquely acclimated to the Great Plains environment; it suffers from few disease or insect problems; it tolerates both wet and dry soils; and its fruits are prized by cedar waxwings and other colorful birds.

Hackberry is not perfect. It has been over-planted in some communities and it tends to break up in wind and ice storms when not properly pruned and cared for. It can also be very opportunistic (nice word for "weedy"). Birds are able to spread its seeds far and wide and seedlings are often found growing in alleys,

woodlots and other out-of-the-way places within a community. This opportunistic nature, however, has one good advantage—free trees are available for those willing to transplant them. Indeed, hackberry is hard to find in nurseries, so digging a seedling is sometimes the best option.

The important message here is not to promote the widespread planting of many more hackberries. Rather, the point is to encourage us all to appreciate the many hackberries we already have, work hard to maintain them properly, and when possible, assist in their renewal by planting a few here and there so that they will be in our communities for years to come. As I sit and watch the cedar waxwings enjoy a late winter meal of hackberry seeds, on the tree that will almost fully shade my neighbor's backyard in the coming months, I can't help but feel very thankful for a species that gives so much while asking for so little in return.

"In the intimate and humanized landscape, trees become the greatest single element linking us visually and emotionally with our surroundings. Other manifestations of nature—great rocks, deserts, moors, torrents, hurricanes—stir us, fill us with awe, make us afraid or humble, but a tree we understand and can allow to become part of us. It's no wonder that when we first think of a garden we think of a tree."

Thomas D. Church

Pine Wilt Disease and Emerald Ash Borer



Justin Evertson

Pine wilt disease and the potential threat of emerald ash borer have many Nebraskans concerned about the future of some of the state's most popular trees. Here are some fast facts about these threats. For more information, go to: <http://www.nfs.unl.edu/program-foresthealth.asp>

Pine Wilt

Pine wilt has already killed thousands of otherwise healthy Scotch pine in southeast Nebraska and also



Emerald Ash Borer (Adult)

Forestry Images: www.forestryimages.org
photo by: David Cappaert

Thousands of Scotch pines have died of Pine Wilt Disease (top photo taken in Auburn). Though not yet sighted in Nebraska, Emerald Ash Borer has killed millions of trees in more eastern states and is moving westward toward Nebraska, often by means of transported firewood.

has begun to kill Austrian pines. The disease is advancing north and west across state and shows no signs of slowing down. Scotch pine and Austrian pine have been the two most common pines planted in the state, especially in shelterbelts, over the last 50 years. The potential loss from this pest is significant and could eventually total millions of trees. As such, Scotch pine is no longer recommended for planting throughout most of the state.

Susceptible trees: Scotch pine is highly susceptible and Austrian pine somewhat susceptible.

Symptoms: Faded, gray-green needles eventually turn brown. Trees die rapidly, sometimes branch-by-branch, usually between late summer and early spring.

Cause: Pinewood nematode attacks tissues in the wood, decreasing water flow and eventually killing the tree. The nematodes are carried to other trees by pine sawyer beetles, which tunnel in the wood of dying pines (including those dying from pine wilt). Emerging beetles can carry thousands of nematodes on their bodies. As they feed on new shoots of healthy pines, they create wounds through which nematodes infect the tree.

Control: Diseased trees cannot be saved and should be destroyed (burned, buried or chipped before beetles emerge from the wood) to prevent spread to healthy trees. Highly valuable trees can be protected with a trunk injection of abamectin, available from certified arborists.

Emerald Ash Borer

Over the last few years, the emerald ash borer (EAB) has killed millions of native ash trees in Michigan, Ohio and Indiana and it has the potential to kill most of the ash trees in the eastern U.S. Many experts believe it is likely that the insect will reach Nebraska (probably on firewood) within the next several years.

The potential impact is enormous since green ash is one of the most common trees found throughout Nebraska in communities, on farms and in native woodlands. Because of the threat of EAB, native ash species including green ash (*Fraxinus pennsylvanica*), white ash (*F. pennsylvanica*), blue ash (*F. quadrangulata*) and black ash (*F. nigra*) are no longer recommended for planting in the eastern half of Nebraska, and should be used only with caution and in limited numbers in the western part of the state. This recommendation includes all of the common native ash cultivars such as 'Patmore' and 'Marshall's Seedless' green ash as well as 'Autumn Purple' white ash.

Susceptible trees: All North American ash (*Fraxinus*) species and cultivars are susceptible (not mountain-ash or *Sorbus*, which is not a true ash).

Symptoms: Exit holes in ash bark about 1/8" in diameter and "D-shaped"; zigzag tunnels under the bark; tunnels packed with sawdust; dieback from top of tree.

Cause: Emerald ash borer—slender, emerald-green beetle about 1/2" long.

Control: None at present. Trees usually die within three years of infestation.



Trees with a Split Personality

Bob Henrickson

Even a quick look at trees growing in an urban environment makes it easy to see the stresses they have to endure. We plant them in pits, parking islands, compacted construction sites and basement sub-soils and expect them to perform. We forget that Nebraska is a plains state where prairie once ruled and where trees were often found only along streams and rivers. The plains climate has always been tough on trees, with damage from wind, ice, heat, drought, insects and diseases, to name just a few. We are familiar with these problems, but we forget that these stresses are even more magnified in the urban environment.

Arborists and other tree professionals often consider only the top of the tree—leaves, branches and trunk—in diagnosing problems. The rootstock or root system, often the most important part of the tree, is more difficult to examine. After planting and caring for trees over the years, I'm constantly reminded that, for the health and performance of a tree, "it's all in the roots." If roots are stressed from poorly drained, oxygen-deprived soils or from compacted or contaminated soil, the tree will be more vulnerable to insects, diseases and other problems.

While poor soil or planting depth is an obvious cause of problems, there is another stress that is rarely considered. According to John Ball of South Dakota State University, "many of our urban trees suffer from a split personality... they're really two trees, the trunk and canopy is one species, the roots another." Named cultivars or clones are a group of cultivated plants distinguished from other plants of the same species by a

characteristic retained in propagation.

Many tree cultivars are propagated by a grafting technique called budding, in which a single bud taken from the desired cultivar is nestled within a fold made in the lower stem of a seedling tree. The initial sideward growth from this single bud is what causes the slight crook at the base of the stem. The top of the tree, referred to as the scion, originates from the single bud taken from a specific tree or cultivar. The bottom, called the rootstock or understock, is beneath the scion and consists of the lower few inches of the stem (where the bud is grafted) and the entire root system.

In the past, many shade tree cultivars were selected for desirable growth habit or fall color, with little regard for drought- or heat-tolerance or adaptability to various soil types. Fortunately, today's cultivars are selected not only for shape, size and fall color, but also for how well they tolerate urban growing conditions.

Two common cultivars in the urban landscape include Autumn Purple white ash (*Fraxinus Americana* 'Autumn Purple'), selected from a single specimen in Ohio known for its outstanding deep purple fall color and 'October Glory' red maple (*Acer rubrum* 'October Glory') selected from a tree with crimson red fall color. When the scion wood is collected from these trees we know where the trees come from, but the origin of the lower portion of the tree or rootstock is usually a mystery. Very rarely are we aware of the origin of the rootstock (and yes, that does matter when you consider that red maples grow naturally from northern Minnesota to Florida).

Most white ash cultivars, including 'Autumn Purple', are budded onto green ash rootstock. Green ash is commonly

used as an understock for many ash species and for this reason has been dubbed "the universal donor." Though grafting has enabled us to select cultivars with superior ornamental qualities, these trees lack the full genetic representation of a species, including its ability to overcome a wide variety of stress factors. One of the questions we need to ask is "Will these trees be prone to failure before they reach maturity?"

There are well-documented cases of graft incompatibility, even when the scion and the rootstock are of the same species. In the 1970s, many red maples grown from budded trees began to decline for no apparent reason. Researchers determined that the problem was delayed graft incompatibility, i.e. the failure of the graft does not occur until five to 10 years after budding, when the tree is already established in the landscape. Maples were showing premature fall color, dieback and shedding bark; many were dying. Because of this, nursery growers began developing maple cultivars on their own roots via cuttings or tissue culture rather than grafting.

Ornamental trees endure a lot of unique, stressful situations in the urban landscape. Their "split personality" may not be the primary stress they have to overcome, but it is a problem not shared by their forest cousins. To truly diversify the urban community forest, we need to consider planting more trees that are produced from seed. By simply planting one seed-grown red oak or Kentucky coffeetree for every 'Autumn Blaze' maple or 'Skyline' honeylocust, we can make a good start toward diversity and sustainability in our community landscapes.

Top: Most white ash cultivars, including 'Autumn Purple', are budded onto green ash rootstock.

Bottom: Red maple cultivars are often prone to bark sloughing, due in part to delayed graft incompatibility.

The Value of Large Trees continued from cover
an ironic though predictable twist of fate, an insect called the emerald ash borer (see article on page 4) is advancing toward Nebraska. Emerald ash borer has the very real, and likely, potential to wipe out most ash trees, including the green ash which is the most common shade tree found in many Nebraska communities.

So why have we not done a better job of planting and caring for large-growing trees? Although the reasons can vary from place to place, some common considerations include:

Our disconnect from nature.

In our modern world, many people live in air conditioned homes and travel to air conditioned offices in air conditioned vehicles. Our leisure time is often spent indoors watching TV or going to movies, restaurants and shopping places. We just don't connect to the outdoors like we used to. Perhaps we have collectively forgotten (or never experienced) the value of shade trees.

Impacts from lawn care.

Lush, green lawns have come to dominate planted landscapes across Nebraska and throughout much of the country. Unfortunately, many of the inputs and activities needed to maintain such lawns can have negative consequences for trees. Over-watering, herbicide damage, compacted root zones and trunk injuries from mowers and trimmers are all very common to trees in turf-dominated landscapes.

Construction and community development.

In any community, trees are often in the way of construction activities, utility work and normal maintenance of the built environment. Tree trunks and branches in construction zones are rarely or inadequately protected and are frequently damaged from careless equipment operators. An even bigger problem is the damage done to tree roots by trenching and soil compaction from heavy equipment.

Poor choice of species.

Many of the shade trees planted today are selected primarily for such things as uniform shape and habit, a certain fall leaf color and a desire for trees to not be "messy" (often meaning fruitless). As such, grafted male clones from just a few species, including green ash, white ash and red maple, have come to dominate the market. Many of the better-adapted and longer-lived species are not nearly as popular.

Poor planting practices.

Somehow we have forgotten, or more likely never learned, how to properly plant trees (see article on back cover). For various reasons, many trees planted today are planted too deep and often with significant root problems. Other common mistakes include the failure to remove balling twine and burlap, poor staking and poor mulching.

Poor nursery stock.

A mass-market society seeking the lowest cost alternative has led to the purchase and planting of many low-quality trees. Questionable hardiness and pot-bound roots are very significant problems—especially from big-box stores and other retailers that set up temporary nurseries in their parking lots each spring. It is important to purchase trees from reputable, local nurseries that have the experience and knowledge to stock only the highest quality trees, and that will stand by their products.

Poor care.

Whether through ignorance or outright neglect, many community trees do not get the care they deserve. Over-watering, under-watering, mower blight, poor pruning, dogs chained to the trunks, etc. are all common across a community. Although it may be naive to think that every tree can have perfect care, it should be an easy matter to raise overall care of community trees through better promotion and education.

Fear of big trees.

Many people fear that big trees will cause big problems—such as large, falling limbs, higher maintenance costs and higher removal costs when they need to be taken out. It is true that bigger trees can lose bigger limbs and they do have higher maintenance costs. However, well-cared for trees rarely have significant limb failures and the benefits of large trees can exceed maintenance costs by an 8 to 1 margin*.

The Simple Act of Planting Better Trees

Justin Evertson

The writing on the wall is clear: large-growing trees are very important to individuals as well as communities as they return benefits valued at up to \$65/tree/year (which is more than four times higher than the value for small trees*). And yet, for most communities, the number of large-growing trees being planted is not keeping pace with removals. In fact the tree cover for most towns has declined significantly from just a few decades ago.

Now is the time to begin the significant effort of reforesting Nebraska communities and to prepare for the potential loss of pine and ash trees (see article on page 4) by planting trees at a much faster pace and including a much wider variety of larger-growing species. A cooperative effort must be undertaken to retake the streets, parks and backyards from the timid tree-planting activities of the recent past and once again restore our communities to the tree-filled glories they once were. Such an effort won't be easy and it won't be without cost, but it will most definitely be a wonderful gift to ourselves and future generations.

* Estimate from the Center for Urban Forest Research, USDA Forest Service. Additional benefits of large-growing trees can be found at: <http://www.fs.fed.us/psw/programs/cufr/>



From top: Large-growing trees are important even in very urban settings, such as this plaza in downtown Kansas City. Trees shade a bench in Atchison, KS. Kentucky coffeetree is one of the most beautiful and adaptable large-growing trees for Nebraska. Here they grace pathways at Harmon Park in Kearney.

"A single great tree can make a kind of garden, an entirely new place on the land, and in my mind I was already visiting the place my maple made, resting in its shade. I knew it wouldn't happen overnight, probably not even in my lifetime, but wasn't that precisely the point? To embark on a project that would outlast me, to plant a tree whose crown would never shade me but my children or, more likely, the children of strangers? Tree planting is always a utopian enterprise, it seems to me, a wager on a future the planter doesn't necessarily expect to witness."

Michael Pollan, *Second Nature*

Return of the Elm

Justin Evertson

Until the 1970s, elm trees were perhaps the most common trees planted in communities across Nebraska. American elm (*Ulmus americana*) was especially popular as its tall, arching habit made it an ideal shade tree for planting along streets, in parks and in backyards. In many communities the American elm comprised more than half the total species planted in public spaces. Unfortunately, Dutch elm disease spread rapidly across the state in the 1960s and 70s, killing most American elms along the way and laying bare the leafy canopies that once graced so many of our streets.

During and after the dustbowl years of the 1930s, Siberian elm (*Ulmus pumila*) also became a popular tree across much of Nebraska. The tree was able to grow with almost no care and could survive extreme drought

conditions, making it quite common in western Nebraska. To this day it remains the primary shade and windbreak tree for our family farm in Kimball County. Unfortunately, Siberian elm has also proven to be a weak-wooded and “messy” tree with a weedy, invasive habit, making it a tree that is scorned by many people.

With those stark visions clouding our minds it is understandable why elms fell out of favor and are rarely planted in communities today. Fortunately, some forward looking people have worked hard for many years to develop new elm varieties that should be planted more. New species have been discovered, unique forms have been hybridized and disease-resistant varieties of the old American elm have been developed.

There are many benefits to these new elms:

The most prominent new elms are resistant to Dutch elm disease. In addition, many are also resistant to elm leaf beetle, thus retaining a much greener appearance throughout the growing season.

Several of the elms are able to tolerate a wide range of growing conditions including the poor soils and the extreme climate of the Great Plains.

The tall, arching habit of some elms makes them especially useful for planting along streets and in parks where many treeless gaps still exist.

The new elms help greatly expand the diversity of large-stature trees available for planting in Nebraska.

These elms add a variety of interest and beauty to the landscape through unique leaf, bark and branching characteristics.

So plant an elm!

Ten Elms To Try

‘Valley Forge’ American Elm *Ulmus americana* ‘Valley Forge’

Several large American elms survived the ravages of Dutch elm disease and have been used to develop disease resistant, cloned cultivars including ‘Valley Forge’, ‘New Harmony’, and ‘Independence’. ‘Valley Forge’ is recognized as being the most disease resistant. The tree is adaptable to a wide variety of soil conditions and tolerates deicing salts, air pollution, drought, and a range of soil pH. American elm has an upright, arching habit making it an ideal street tree. It can grow 50’-70’ tall and equally as wide.

Japanese Elm

Ulmus davidiana var. *japonica*

Japanese elm has proven hardy as far north as North Dakota and Manitoba, Canada. The species has been disbursed by NSA for testing in Nebraska and early reports are promising, especially for eastern Nebraska. The tree is also a parent to many of the more promising hybrid elms. Japanese elm has glossy green leaves, relatively tight branching and a rounded habit with the potential of growing up to 40-50’ tall by 30-40’ wide.

‘Cathedral’ Elm

Ulmus davidiana var. *japonica* × *pumila*

Cathedral elm was developed at the University of Wisconsin by crossing Siberian elm with Japanese elm. It is a fast grower, is tolerant of clay soils, and has a yellow to orange fall color. The tree has a broad, vase shape and grows 40-50’ tall by 40-50’ wide.

‘Frontier’ Elm

Ulmus parvifolia × *carpinifolia*

This very attractive hybrid shares many characteristics of lacebark elm (one of its parents) including small, glossy leaves that turn a dusty purple in the fall, and mottled bark on maturing trunks. Although some reports indicate winter dieback in the Great Plains, it has performed well in southeast Nebraska for several years. Can grow 30-40’ tall by 25-30’ wide.

‘Pioneer’ Elm

Ulmus glabra × *carpinifolia*

Pioneer elm has been planted in several locations in Nebraska and has performed well in Creighton, Pierce, Waverly and Alliance, among other communities. It is a fast grower with dark green leaves and an upright, pyramidal habit when young. Pioneer elm will eventually be a rounded tree growing 40-50’ tall by 40-50’ wide.

Triumph™ Elm

Ulmus × ‘Morton Glossy’

Triumph elm was developed at the Morton Arboretum by crossing Vanguard™ elm with Accolade™ elm. It has a vigorous, upright habit

with strong branches bearing glossy, deep-green foliage. The tree appears to be very adaptable to a wide range of growing conditions and will grow 50-60’ tall by 30-40’ wide.

Vanguard™ Elm

Ulmus japonica × *pumila* ‘Morton Plainsman’

Vanguard elm is another Siberian elm/Japanese elm hybrid which was developed at the Morton Arboretum. The tree is considered to be very tolerant of high heat and drought, thus making it a promising selection for the western Great Plains. The tree has dark green foliage, a rounded vase shape and will grow 40-50’ tall by 40-50’ wide.

Rock Elm

Ulmus thomasii

Rock elm is native to the eastern U.S., including eastern Nebraska. Its relatively narrow and upright habit is reminiscent of pin oak. A very distinctive feature of this tree is the corky ridges found on stems and young branches that eventually develop into a deeply fissured bark. Several Rock elms have grown tall and old in Cheyenne, WY, giving testament to its hardiness and adaptability. Rock elm can grow 50-60’ high by 30-40’ wide.

Lacebark Elm

Ulmus parvifolia

The common name of this elm refers to the very attractive mottled, lacy bark that develops on older stems. Lacebark elm is sometimes called Chinese elm in reference to its native range of China, Japan and Korea. The leaves are smaller than most elms and are deep green and very glossy. Flowering occurs in late summer with seed development in early fall. The yellowish seeds are quite attractive against the shiny green leaves. Many trees also develop a nice reddish fall color. This tree is best adapted to the southern half of Nebraska. ‘Emerald Prairie’ is an exciting new cultivar developed in Kansas that may have better cold hardiness. Lacebark elm is a medium-sized tree growing to 25-40’ tall by 20-35’ wide.



From top: Accolade™ elm; leaf of American elm. Japanese elm is a graceful tree that has good potential for the Great Plains. Rock elms growing along a street in Cheyenne, WY attest to the tree's toughness. Lacebark elm with emerging seeds.

Fifty Large-Growing Trees for Nebraska

Justin Evertson

Even in a prairie state like Nebraska, there are many trees that will grow well if given a chance. The following 50 species of large-stature trees are suitable for planting in much of Nebraska. All will grow at least 30' tall. An **E** indicates trees primarily suited to the eastern half of the state. The size listed is the average range of height and spread at maturity.

Buckeye, Ohio, *Aesculus glabra*, 30' x 30'

Catalpa, Northern, *Catalpa speciosa*, 50' x 35'

Cherry, Black, *Prunus serotina*, 35' x 20'

Coffeetree, Kentucky, *Gymnocladus dioicus*, 50' x 40'

Corktree, Amur, *Phellodendron amurense*, 35' x 40'

Cottonwood, Eastern, *Populus deltoids*, 80' x 70'

Elm, miscellaneous, *Ulmus* spp. (see article on page 6)

Filbert, Turkish, *Corylus colurna*, E 40' x 25'

Ginkgo, *Ginkgo biloba*, E 50' x 40'

Goldenrain Tree, *Koelreuteria paniculata*, E 35' x 25'

Hackberry, *Celtis occidentalis*, 60' x 50'

Hickory, Shagbark, *Carya ovata*, E 50' x 40'

Honeylocust, Thornless, *Gleditsia triacanthos* var. *inermis*, 60' x 50'

Horsechestnut, *Aesculus hippocastanum*, E 40' x 30'

Linden, American, *Tilia americana*, 60' x 40'

Linden, Littleleaf, *Tilia cordata*, 45' x 30'

Linden, Silver, *Tilia tomentosa*, E 50' x 40'

Locust, Black, *Robinia pseudoacacia*, 35' x 25'

Maple, Miyabe, *Acer miyabei*, 30' x 25'

Maple, Sugar, *Acer saccharum*, 50' x 50'

Oak, Bur, *Quercus macrocarpa*, 60' x 70'

Oak, Chinkapin, *Quercus muehlenbergii*, 45' x 40'

Oak, English, *Quercus robur*, 60' x 50'

Oak, Red, *Quercus rubra*, 60' x 50'

Oak, Sawtooth, *Quercus acutissima*, E 60' x 40'

Oak, Shumard, *Quercus shumardii*, E 50' x 40'

Oak, Swamp White, *Quercus bicolor*, 60' x 50'

Oak, White, *Quercus alba*, E 60' x 50'

Pagodatree, Japanese, *Sophora japonica*, E 40' x 30'

Pear, Callery, *Pyrus calleryana*, 35' x 25'

Pecan, *Carya illinoensis*, E 60' x 50'

Planetree, London, *Platanus x acerifolia*, E 75' x 50'

Poplar, Silver, *Populus alba*, 75' x 60'

Sycamore, *Platanus occidentalis*, 80' x 50'

Tulip Tree, *Liriodendron tulipifera*, E 50' x 40'

Walnut, Black, *Juglans nigra*, 60' x 45'

Yellowwood, *Cladrastis kentukea*, E 35' x 25'

Evergreen Trees

Douglasfir, *Pseudotsuga menziesii*, 50' x 30'

Fir, Concolor, *Abies concolor*, 50' x 25'

Juniper, Rocky Mountain, *Juniperus scopulorum*, 35' x 20'

Pine, Austrian, *Pinus nigra*, 60' x 35'

Pine, Bosnian, *Pinus heldreichii* var. *leucodermis*, 45' x 30'

Pine, Eastern White, *Pinus strobus*, E 70' x 40'

Pine, Jack, *Pinus banksiana*, 40' x 25'

Pine, Limber, *Pinus flexilis*, 50' x 30'

Pine, Ponderosa, *Pinus ponderosa*, 65' x 30'

Redcedar, Eastern, *Juniperus virginiana*, 40' x 30'

Spruce, Black Hills, *Picea glauca* var. *densata*, 50' x 30'

Spruce, Colorado, *Picea pungens*, 65' x 35'

Spruce, Norway, *Picea abies*, 70' x 40'

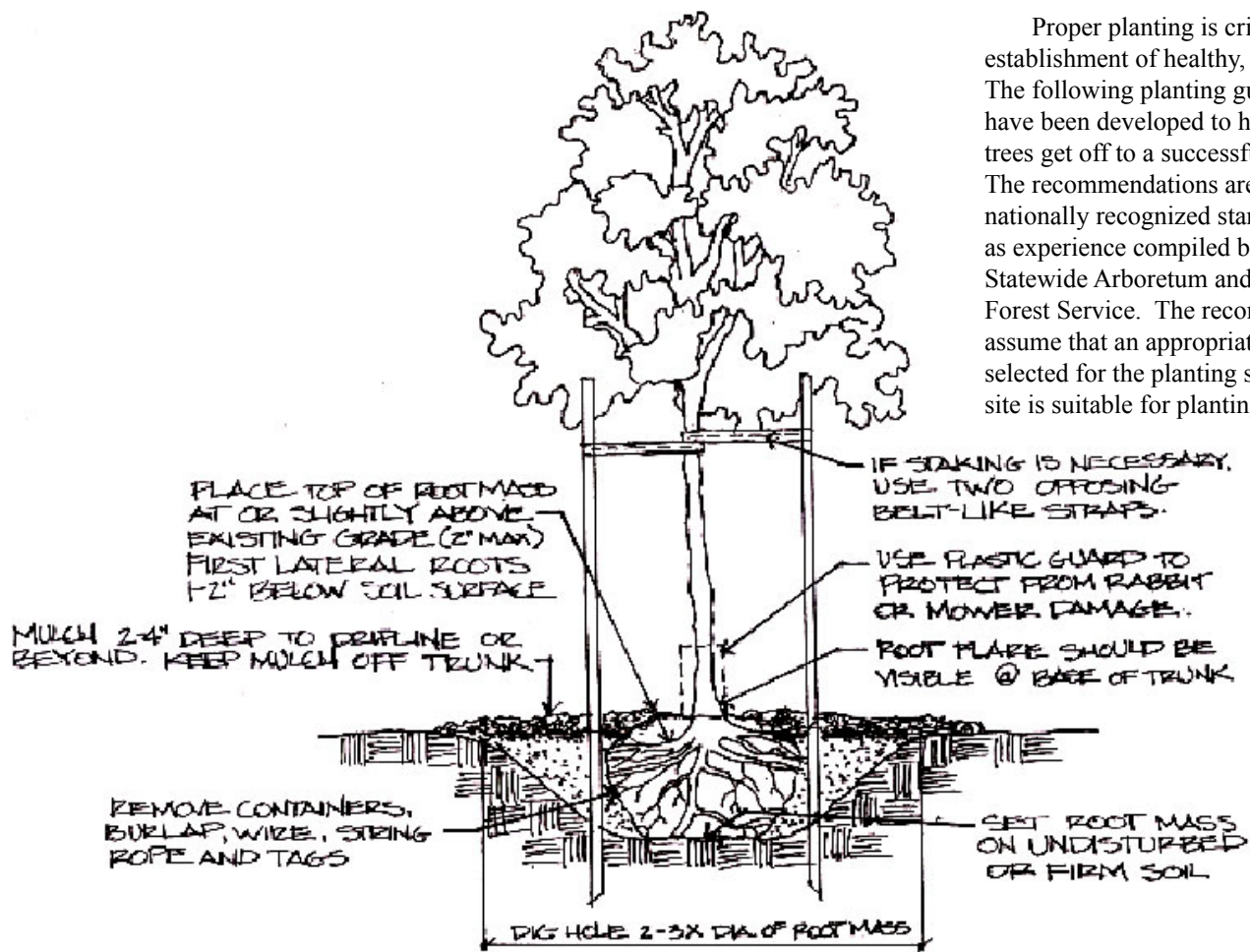


There's lots to love if you're looking for large shade trees for Nebraska. From top: Bur oaks on the campus of Peru State College ("Campus of a Thousand Oaks"). Fall foliage of white oak. Creamy, mottled bark of London planetree. Concolor fir (*Abies concolor*) is one of the most graceful evergreens for Nebraska. Many large specimens, including the state champion, can be found at the CABG Patch Arboretum—an NSA affiliate site just north of Omaha.

Tree-planting for Success

Justin Evertson

Proper planting is critical to the establishment of healthy, thriving trees. The following planting guidelines have been developed to help new trees get off to a successful start. The recommendations are based on nationally recognized standards as well as experience compiled by the Nebraska Statewide Arboretum and the Nebraska Forest Service. The recommendations assume that an appropriate tree has been selected for the planting site and that the site is suitable for planting.



TYPICAL TREE PLANTING DETAIL
(NO SCALE)

- All graft unions should be visible above the soil line.
- Remove all pots and containers before planting.
- For balled and burlap (B&B) stock, try to remove the wire basket and burlap before placing the tree in the hole. If maintaining the integrity of the soil ball is important, then remove the bottom part of the burlap and wire basket before setting the plant in the hole and then remove the remaining burlap and wire basket after stabilizing the tree in the hole. Remember to check for and remove any excess soil at the top of the root ball before planting.
- **Loosen and spread circling roots before backfilling** (especially important for potted trees). It may be necessary to cut larger roots that cannot be straightened to prevent girdling, but this should be done with caution. Reject plants with severely circled or girdled root systems.
- For potted trees, try to remove as much of the original growing medium as possible before planting to help achieve good soil-root contact. Dunking in water or spraying with a hose will help in this effort.

BACKFILLING

Backfill with the original soil dug from the hole. Large clods and soil chunks should be broken up as much as possible. Adding water during backfilling can help remove air pockets and better moisten the roots.

MULCHING

Mulch individual trees with a 2-4" layer of wood mulch extending from the trunk to at least the drip line of the tree. Where possible, mulch trees and other plantings together en masse to help separate from surrounding turf. **Don't** pile the mulch deeply over roots or against the base of the trunk and **don't** mulch with rock or use plastic weed barriers under the mulch.

STAKING AND BRACING

Brace the tree if it might dislodge or blow over in the wind (most trees typically benefit from staking). Some sway should be allowed in the tree after staking. Use only broad, belt-like materials to attach the bracing to the trunk to help prevent rubbing injuries. **Do not** brace with wire, rope or wire through hose. Remove staking within one year.

DIGGING

Dig a saucer-shaped hole wider than the root system but no deeper than the root mass. Most holes do not need to be deeper than about one shovel's depth (10-14"). The bottom of the hole should be firm enough to prevent the tree from settling deeper after planting. **Note:** Using an auger is not recommended since trees often settle too deep and the sides of the holes become glazed. If using an auger, don't drill deeper than needed and loosen the sides of the hole.

PLANTING

Plant so that the base of the trunk is at original ground level or slightly higher. **The first lateral roots should end up just under the soil surface (1-2" deep) and the trunk should flare visibly at ground level.**

- Always locate the first main lateral roots and remove any excess soil above them before setting the plant in the hole. The first main roots are often several inches below the top of the container or root ball.

Post-planting Care and Other Information

WATERING

After planting, keep the root zone moist but not waterlogged. In general, a newly planted tree should receive about 1" of moisture per week, including rainwater, during the first growing season. Check the root zone frequently for moistness—don't just guess. Many trees are lost to either under- or over-watering. Containerized trees often need more watering than bare-root or B&B stock, because the porous growing medium they are potted in dries out faster.

FERTILIZING

If the right tree was selected for the planting site, fertilizer is generally not needed. If fertilizer is desired, use only a slow-release, low-nitrogen fertilizer applied to the soil surface after planting.

- **Never** add fertilizer to the planting hole since it can damage newly transplanted roots. In addition, excess nitrogen in the soil can cause newly planted trees to add top growth at the expense of proper root development.

- Address major soil problems **before** planting. Adding organic matter to the planting site before planting can be very beneficial for poor, inorganic and/or compacted soils.

PRUNING

At planting time, prune only to remove dead or damaged branches and to correct structural defects. Never cut back healthy branches or trim the tree to try and "balance" the top with the roots. The tree will benefit from having as many food-producing leaves left on as possible. Also, try to leave lower branches on a tree for as long as possible after planting. Lower branches help protect the trunk from cracking, sunscald and animal damage and they aid in developing good trunk taper. If needed, limb the tree up gradually over a matter of several years after planting. Monitor the tree when young and prune, sparingly but properly, to prevent structural defects.



Before planting a container-grown tree, examine the root system carefully and remove any excess potting soil and/or root massing above the trunk flare.

For container-grown trees, it is important to try to straighten any roots found growing in a circle. If the roots cannot be carefully pulled straight, the root mass will likely need to be vertically scored (cut) in three or four places around the root mass.

Nebraska tree enthusiasts and a properly planted tree in Cheyenne, Wyoming. From left: Dave Mooter (Kennard), Lyle Minshull (North Platte), Justin Evertson (Waverly), Chip Murrow (Lincoln), George and Gayla Probasco (Arapahoe), Deb Henderson (Hemingford).

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