The Nitty Gritty of
Tree Selection & Care

EXTENSION

Lincoln Parks & Recreation

40 YEARS OF PLANTING
NEBRASKA STATEWIDE
Arboretum

Presenters

Sarah Browning

Extension Educator

Nebraska Extension Educator, since 1998.

International Society of Arboriculture certified arborist

Member of the Nebraska Arborist Association.

Located at the Lancaster Extension office in Lincoln.

Bob Henrickson

Horticulture Program Coordinator
Nebraska Statewide Arboretum, Inc.

International Society of Arboriculture certified arborist

Nebraska Certified Nursery & Landscape Professional.

Kaylyn Neverve

Park Planner

Lincoln Parks & Recreation Department, Planning + Construction Division

American Society of Landscape Architects

The Value of Trees - Why We Bother

Just a few of the benefits…

The Benefits of the Community Forest

- Cooler, more sheltered communities resulting in significant energy conservation!
- Stormwater benefits
- Increased property values
- Wildlife habitat & biodiversity
- Improved economic vitality
- Mental and physical comfort
- A more beautiful and inviting community

How do we address these environmental, economic and social challenges?

- Declining community forests.
- Sterile landscapes and lost wildlife habitat.
- Excessive water consumption.
- Stormwater management issues.
- Pesticide and fertilizer overuse.
- Threats from a changing climate – what does the future hold?
- The global challenge for invasive exotic pests.
- Our general disconnect from nature.

The importance of native trees.

- They are adapted to the native soils and climate.
- They require little if any supplemental irrigation once established.
- They provide critical habitat for important wildlife.

What will be the trees of the future?

- The provenance of tree seed describes its geographical origins.
- When planting trees selecting an appropriate provenance is an important decision which can
- influence tree survival, performance and longevity.
- A key aim of provenance selection is to select trees that will be well-adapted to the prevailing conditions in which it needs to grow.

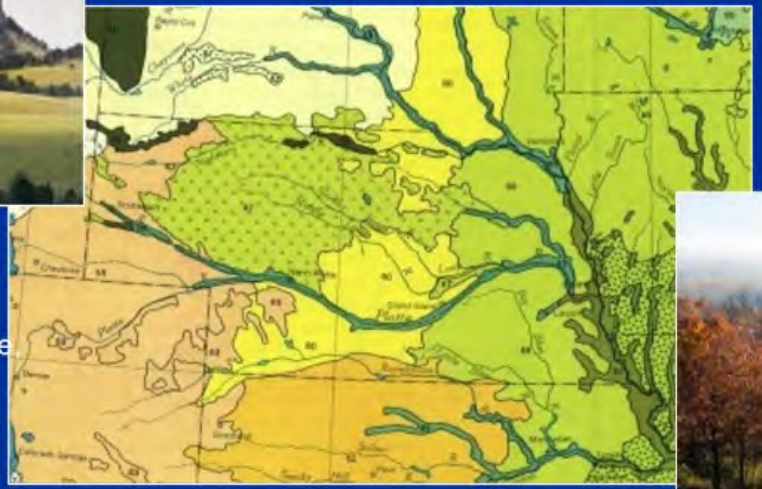
Species Type & Provenance are Important Factors

Many native tree species meet the limit of their natural range in Nebraska—Robert Kaul

Nebraska's forests sit at an ecological crossroads: 35 tree species reach their geographic range limit here - more than any other state.

Western Species Reaching Their Limit

Ponderosa pine, limber pine, Rocky Mountain juniper, Rocky Mountain maple, water birch, mountain mahogany,



Eastern Species Reaching Their Limit:

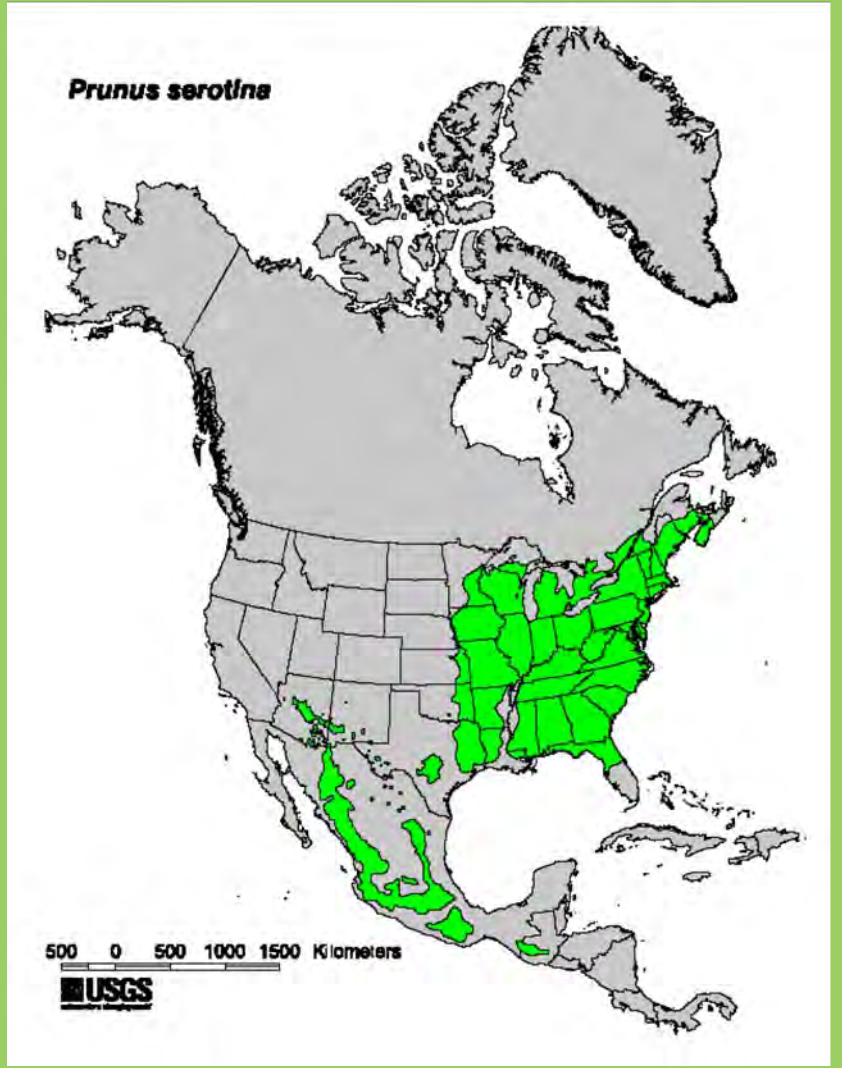
White oak, black oak, red oak, chinkapin oak, blackjack oak, shagbark hickory, bitternut hickory, buckeye, butternut, sycamore, white ash, downy hawthorn, et

Limber Pine

Ponderosa Pine

Kentucky Coffeetree,
Gymnocladus dioicus

Black Cherry,
Prunus serotina

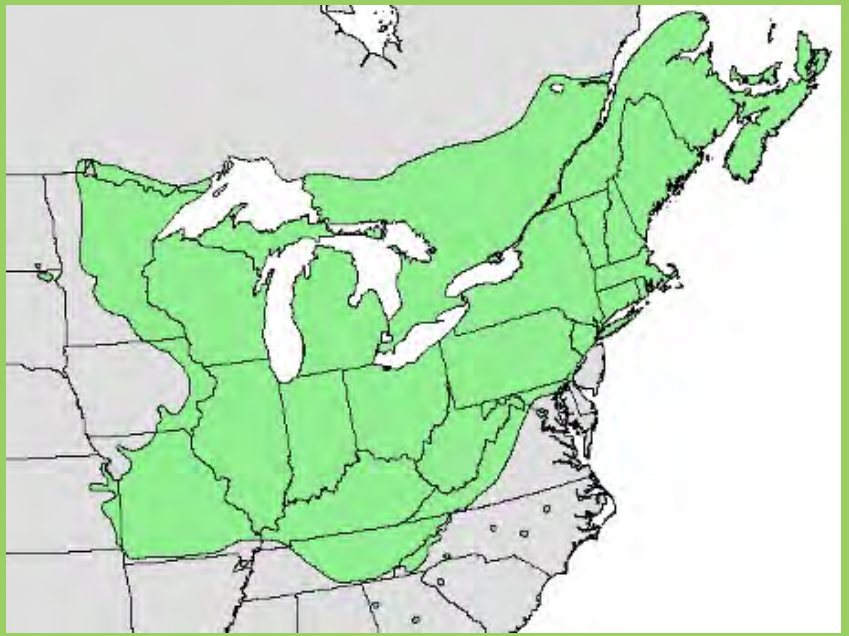


American Sycamore,

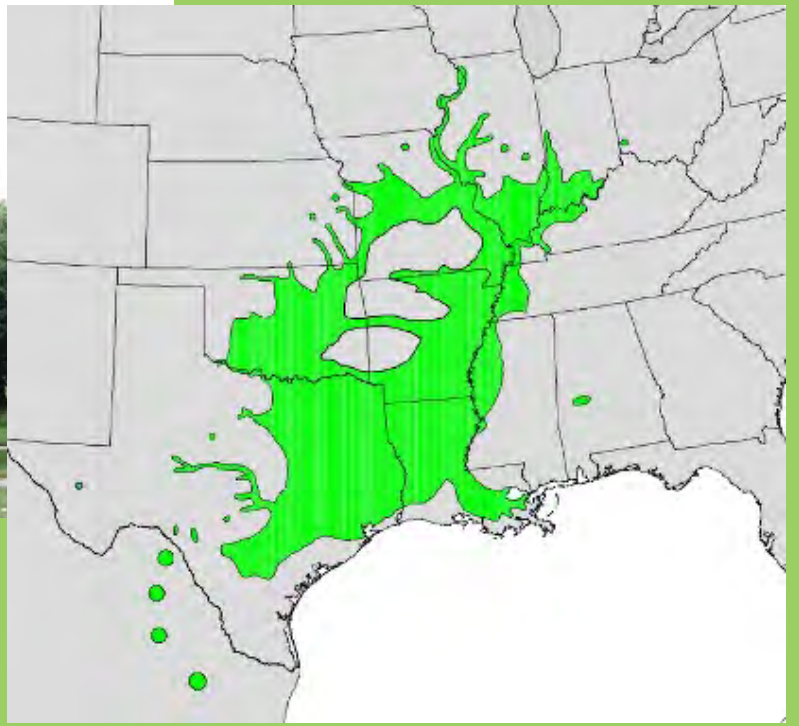
Platanus occidentalis

Bur Oak,
Quercus macrocarpa

Sugar Maple,
Acer saccharum



What does a “regionally native” tree mean?



NORTHERN PECAN

Carya illinoensis

Most urban tree problems are related to poor soils or growing conditions which could be made worse by climate change.

Urban soils are often highly disturbed, lack essential nutrients. Trees are dependent on adequate soil characteristics such as rooting volume, organic matter content, drainage capacity, and nutrient availability to achieve healthy maturity.

Do some trees mitigate CO^2 better than others?

Increased CO^2 storage

- Long life span
- Larger overall growth
- Medium to slower growth rate
- Tissue density
- High tolerance of urban stresses
- Low maintenance with non-fossil fueled equipment
- Trees over 12” DBH are generally carbon neutral

Effects of Urban Tree Management and Species Selection on Atmospheric Carbon

https://go.unl.edu/co2mitigate

How to choose trees

Joe Murray, Treebio.com, Bugwood.org

Rebekah D. Wallace, University of Georgia, Bugwood.org

HTGSupply.com

Select the smallest tree with the largest root ball

How to Chose Your Trees – Example too large

How to Chose Your Trees – Example too large

Containerized most common

Bare root

- Easy install
- Faster establishment
- Low availability
- Handling issues

B & B Grown

- B & B dug trees can remove up to 95% of the root system
- Provide at least 12” of root ball for every 1” diameter of tree trunk.
- In general, for every 1” tree diameter, it will take at least 1 year to recover the original root system.

Grow Bags & Special Containers

Root pruning containers create fibrous root systems using air, constriction or trapping, from propagation to large trees. Rootmaker containers promote root branching and new roots.

This results in a root system that has a greater surface area than conventional production, and therefore achieves greater efficiency in the absorption of water and nutrients.

Great Plains Nursery

RootTrapper® Containers

The RootTrapper® Soft-sided Containers

This unique container stops circling roots and continues to stimulate root branching by trapping root tips.


©2014 GREAT PLAINS NURSERY

City of Lincoln Approved Street Tree List

Home / City Information / Departments / Parks and Recreation / **Community Forestry**

Community Forestry

- Overview
- Fast Forestry Facts
- Emerald Ash Borer
- Adopt-an-Ash Program
- Developer/Contractor Street Tree Information
- Homeowners/Commercial Arborists
- Street Tree Information
- Community Forestry FAQ's

Street Tree Information

Street Tree Planting Guidelines

- Tree Diversity will be emphasized (**i.e. no more than 10 % of same tree type**).
- Ash species will not be cost-shared by City for planting as street trees due to potential Emerald Ash Borer infestation and will not be allowed to be planted on city right of ways due to existing ash street tree population being greater than 25%.
- Large type trees and small type trees will not be planted on same street because of variance in height, form and growing space requirements. Only exception is that small shade tolerant understory type trees (redbud, serviceberry) can be planted beneath large overstory shade trees, provided there is adequate room to accommodate the mature growth of understory tree.

Approved Street Tree List

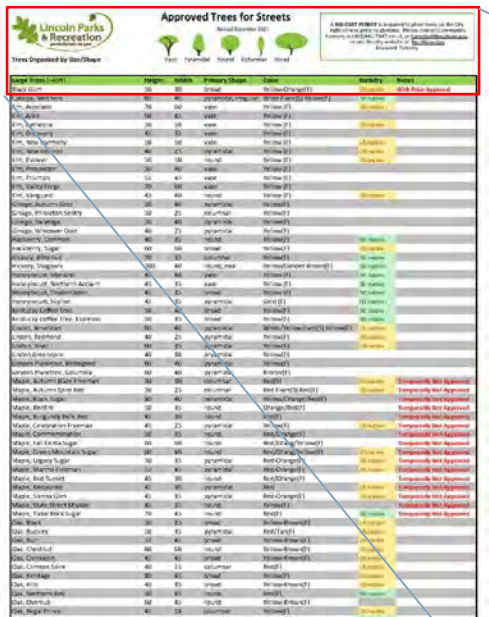
Download the Approved Street Tree List (PDF, 160KB). Updated Jan. 2021

Permit to Plant in the City Right of Way

A no-fee permit to plant trees on city property needs to be obtained BEFORE planting is done. Shrubs, perennial and annual flowering plants, ornamental grasses, and ground covers can also be planted within the sidewalk space, or abutting a sidewalk, and do not require a permit. Those plantings shall be maintained so that they do not extend over curbs, sidewalks, driveways, or alleys and have a maximum height of no more than thirty inches above the height of the adjoining curb.

A no-fee permit to plant any of these trees on **CITY PROPERTY** needs to be obtained **BEFORE** planting is done.

City of Lincoln Approved Street Tree List



Street Tree List is a live link and can be found at:
lincoln.ne.gov
keyword: forestry

Relationship with Insects, Birds and Other Wildlife

- Native woody plants supported 14 times as many insect species as introduced ornamental landscape plants!

IT'S SPRING—I'M HUNGRY

- Bees emerging with the first warm days of spring gather resins from the cottonwoods.
- They mix these resins with their own enzymes and then use this highly antimicrobial glue to line their hive.
- We call this thick sticky glue propolis.

Early-blooming trees provide an important pollen and nectar source for bees in early spring.

Silver Maple

Red Maple

- The most valuable for the bees are:
  - Maple
  - Elm
  - Redbud
  - Buckeye
  - Crabapple
  - Serviceberry
  - Cherries/plum
  - Nannyberry viburnum

Eastern Redbud

Serviceberry

Black Cherry

Wild Plum

Ohio buckeye

Crabapple

Kentucky Coffeetree

Bees & Butterflies collect pollen and nectar from trees such as honeylocust, coffeetree, oak, birch or alder dangling their catkins in the breeze.

Willows (Salix sp.) provide protein-rich pollen for bees in early spring. This gives the bees a boost of energy after they have depleted their stores of honey over the winter.

Studies have shown that only 14% of the native plants available in that region are making 90% of all the caterpillar species. These are the keystone species to support native insect populations.

Realize native plants become more than just landscape plants

- Most insect herbivores can only eat plants with which they share an evolutionary history. They cannot, or will not use exotic or alien plants for food.
- Our native insects will not be able to survive on alien plant species alone.

Insects Don't Like Aliens!

- Leaf eating larval insects encounter leaf chemical defenses.
- Flower shape and amount of nectar are most important—native bees evolved to forage on flowers with particular morphologies.

Common Hackberry,

Celtis occidentalis


Tawny Emperor


Question Mark


Hackberry Emperor


Mourning Cloak

Birds will feed their young exclusively on caterpillars if they get the chance. Caterpillars are an essential part of songbirds ability to raise their young. They are relatively large prey items, they are high in protein, high in fat and soft—with a low percentage of chitin.

Caterpillars are the best source of carotenoids. Vertebrates cannot make their own carotenoids, they get them from plants or something that did eat plants. Grasshoppers, crickets, katydids are also important prey for raising baby birds.

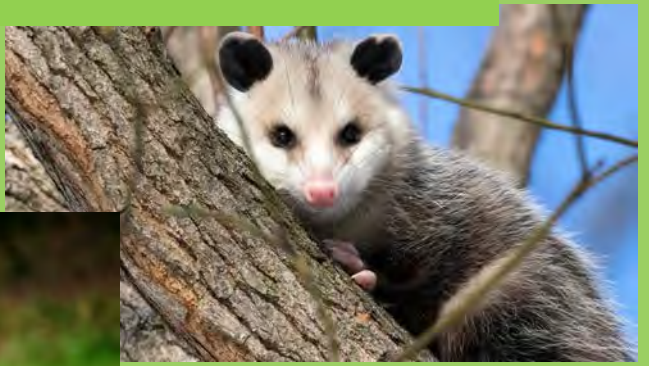
So no insects, no baby birds!

The stats on caterpillar consumption are mind-boggling: a single nesting pair of Chickadees will feed their young ones 6000-9000 caterpillars before fledgling, meaning over sixteen days on average. After fledgling, nobody has counted, but fledged Chickadees get feed for up to three more weeks.

We need a diverse mix of insects for predators too. Spiders eat insects too and they are the second most important component of bird food webs.

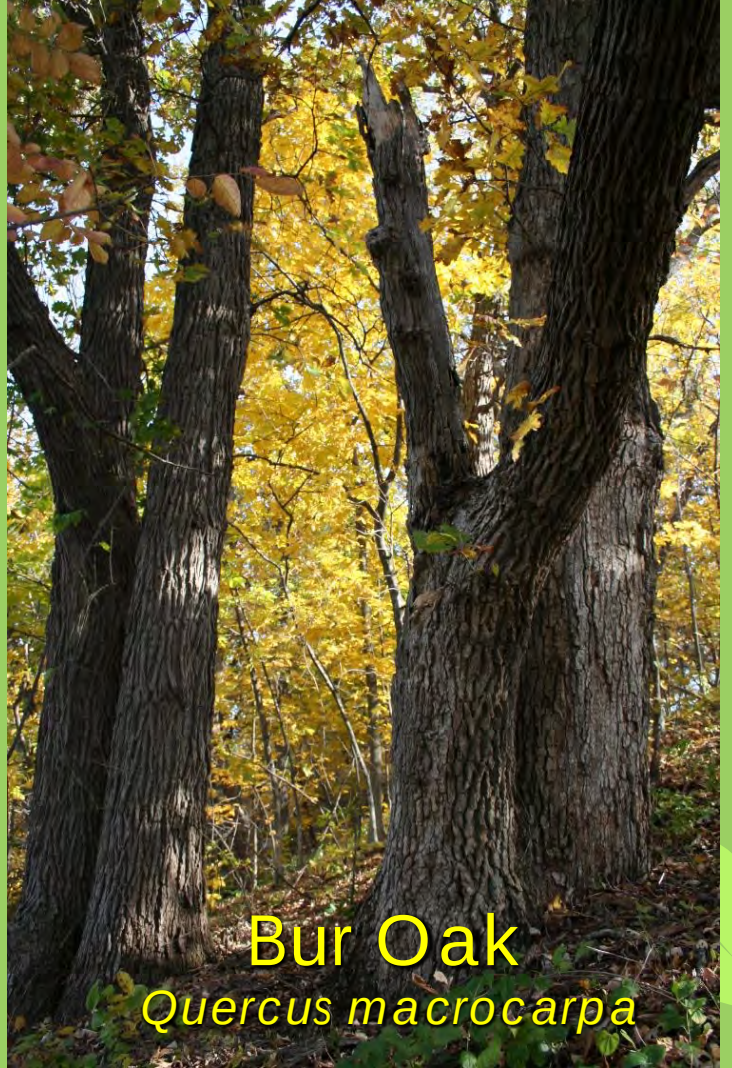
Frog, toads, all amphibians need insects, as do lizards and rodents.

Mammals like skunks, possums and raccoons eat a lot of insects. Even critters we don't think as insectivorous eat a lot of insects, like the red fox and black bear. Up to 25% of their diet is insects.



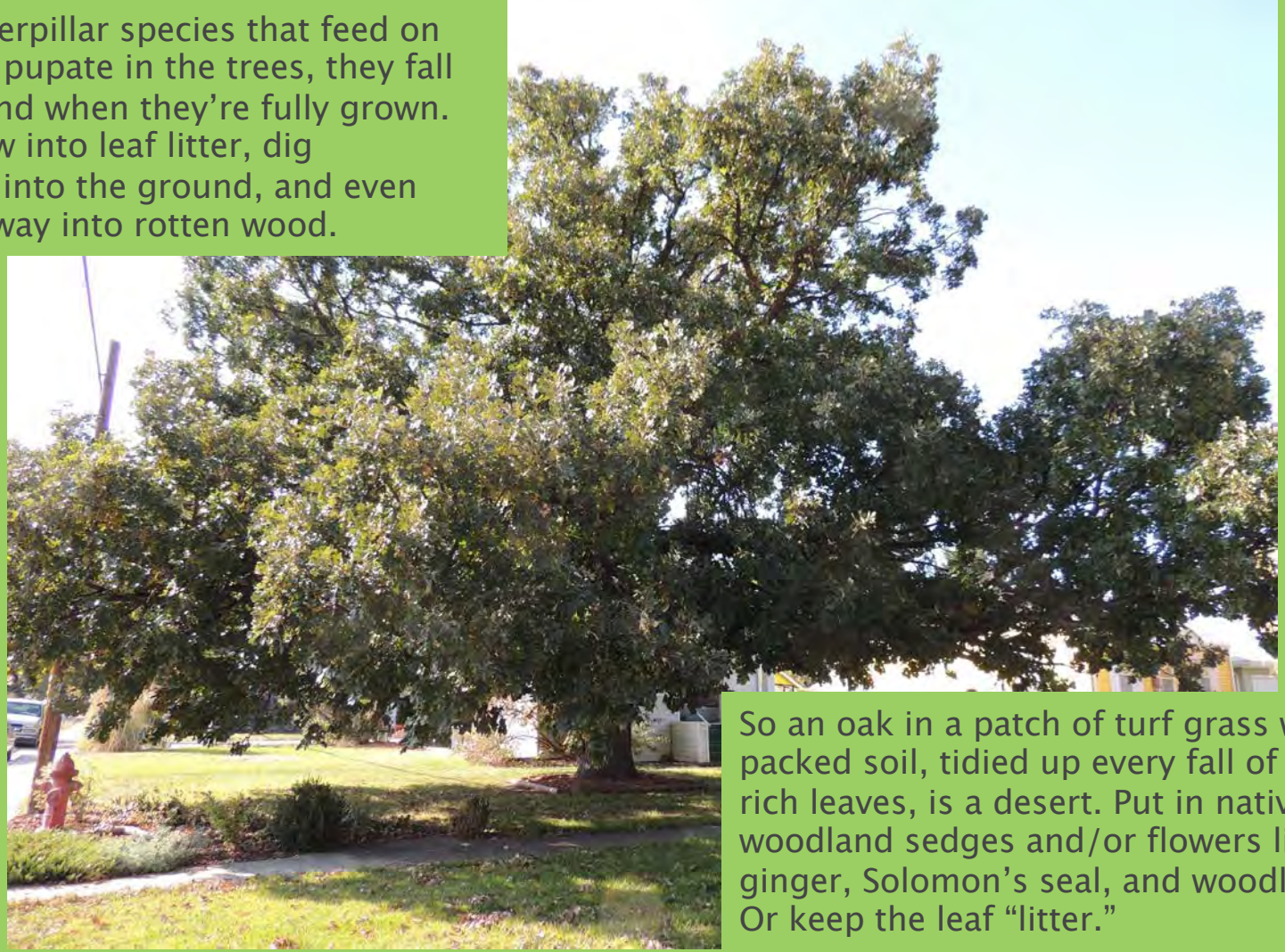
Top Ten Trees: Larval Food Sources for Butterflies & Moths

- Oak – quintessential wildlife plant
- Willow
- Cherry, Plum
- Poplar, Cottonwood
- Crabapple
- Maple, Boxelder
- Elm
- Hickory
- Linden
- Walnut




Oaks provide valuable nut forage for a variety of vertebrate wildlife.
No other plant genus supports more species of Lepidoptera than the oak.
Other insects and wildlife use oaks for shelter and nesting sites.

Most all caterpillar species that feed on oaks, don't pupate in the trees, they fall to the ground when they're fully grown. They burrow into leaf litter, dig themselves into the ground, and even chew their way into rotten wood.



So an oak in a patch of turf grass with hard-packed soil, tidied up every fall of all those rich leaves, is a desert. Put in native shrubs, woodland sedges and/or flowers like wild ginger, Solomon's seal, and woodland phlox. Or keep the leaf "litter."

Many beneficial insects overwinter under leaf mulch—true bugs, beetles, predatory insects, decomposers. Leaf mulch is a necessary component in raising a diverse mix of insect species.

Increase Nesting Habitat for Native Bees—70% of native bees nest in the ground

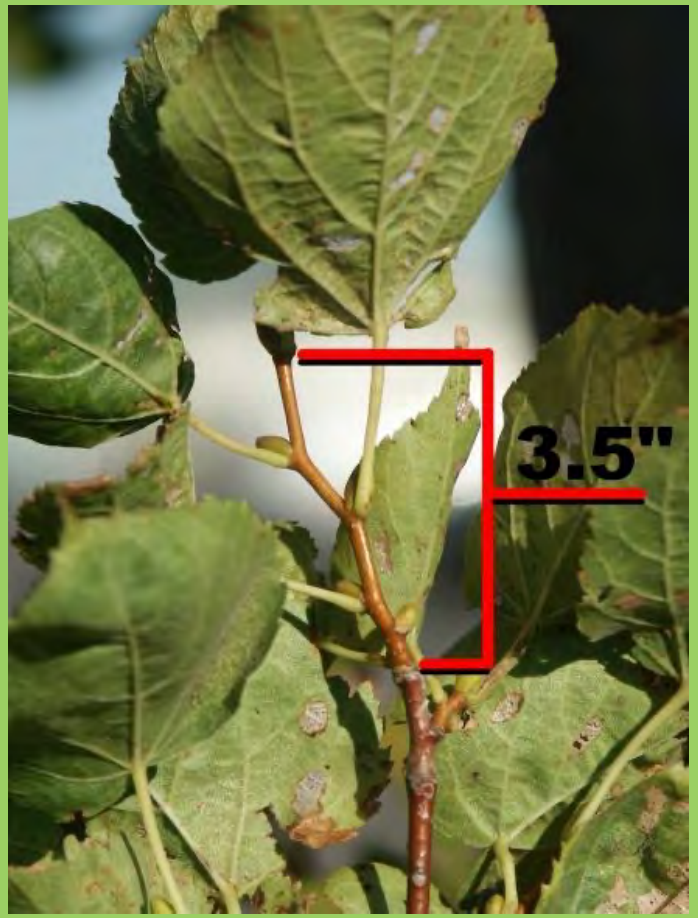
Mulch different

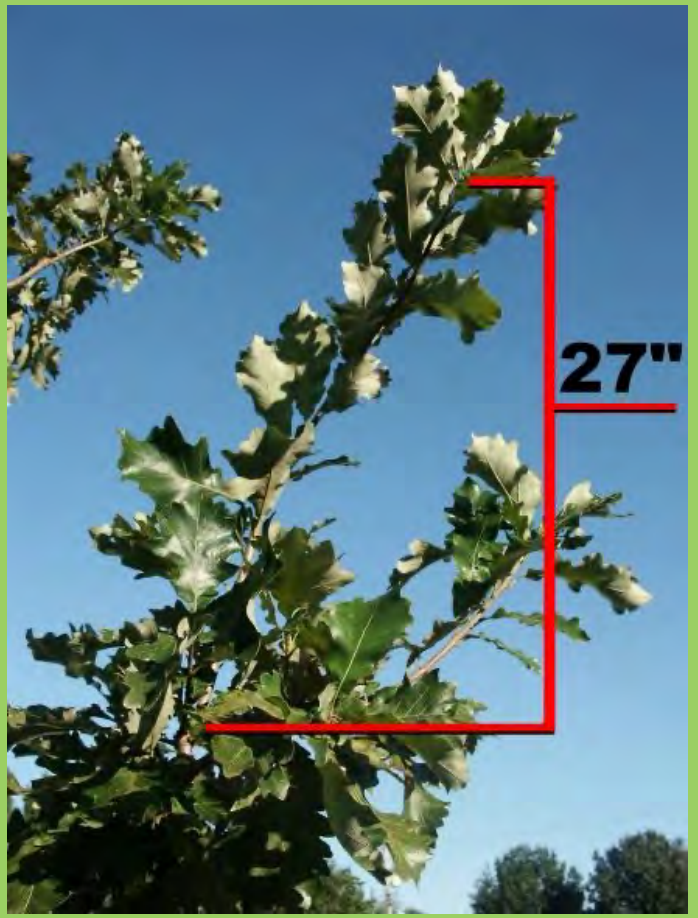
When it comes to ground nesting bees, access to bare ground is essential, and even a 1-inch layer of mulch can be as impenetrable as pavement to these small bees.

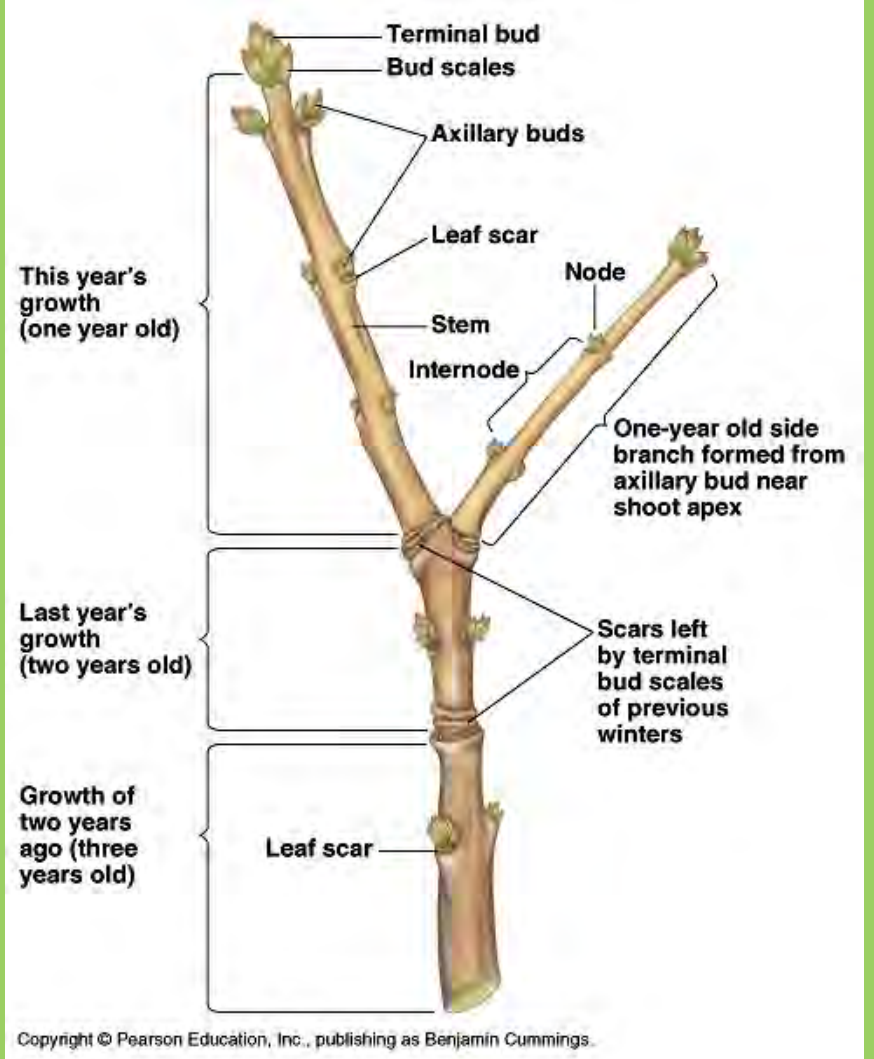
Consider using compost or shredded leaves instead of chipped wood products. They will have the same weed suppression, water retention, and other properties – yet be light enough to allow ground nesting bees to pass through

Expectations for Growth

Annual Growth Rate for Linden vs. Swamp White Oak @ 5+ years








2000
STOP


2005

What About Climate Change?

Nebraska Effects

- Temperature extremes
- Prolonged drought
- Exceptional moisture events
- Creates need for increasing tree diversity

Temperature Swings & Extremes

Spring

- 2/16/21, -31°F (Min temp normal 18.4°F)
- 3/9/21, 77°F (Max temp normal 53.6°F)
- 101 degree difference in 4 weeks

- 4/1/21, 17°F (Min temp normal 39.2°F)
- 4/26/21, 92°F (Max temp normal 64.8°F)
- 75 degree difference

Fall

- 11/17/21 – 75°F (Max temp normal 51.7°F)
- 11/25/21 - 22°F (Min temp normal 28 °F)
- 53 degree difference

- 12/15/21 - 74°F (Max temp normal 39.4°F)
- 12/19/21 - 9°F (Min temp normal 18.2 °F)
- 65 degree difference

Prolonged or Periodic Drought – Impacts on Trees

- Internal water deficit begins
- Stomates close
- Reduction in photosynthesis
- Death of mycorrhizae
- Death of root hairs
- Leaf loss
- Growth slows
- Reduction in plant defensive chemicals
- Death of larger roots

	2021 Actual Rainfall	Normal	Difference	Drought Years	
Jan	1.53”	0.73”	0.8”	1953	17.55
Feb	0.79”	0.89”	-0.10”	1976	17.90
March	5.23”	1.55”	3.68	1988	18.37
April	1.74”	2.69”	-0.95”	2012	19.14
May	2.55”	4.91”	-2.36	1994	22.56
June	4.46”	4.48”	-0.02”	2009	23.08
July	1.73”	3.25”	-1.52”	2000	23.18
Aug	3.41”	3.32”	0.09	2004	23.49
Sept	0.64”	2.90”	-2.26”	2020	23.63
Oct	4.04”	2.14”	1.9”	1995	23.92
Nov	0.49”	1.3”	-0.81”		
Dec	0.25"	1.18"	-0.93"		
Total	26.86	28.16	-1.30”		
Average rainfall in Lincoln approximately 28 to 31 inches					

Exceptional Moisture Events

- Nebraska is experiencing a 16% increase in very heavy precipitation events.*
- Flooding
  - 2019 – $1.3 billion in flood losses
  - 2011 – record snowfall in Montana & Wyoming + near-record spring rainfall in Montana. $2.47 billion (2020 dollars)
  - 1993 - $85 million (2020 dollars)

	2021 Actual Rainfall	Date	Rainfall Amount
March	5.23”	3/14	**2.97”**
June	4.46”	6/11	**1.99”**
		6/24	**1.30”**
		6/25	**1.07”**
Aug	3.41”	8/29	**1.12”**
Oct	4.04”	10/27	**1.62”**
Average rainfall in Lincoln is approximately 28 to 31 inches			

* Top 1% of all daily rainfall events, measured from 1958 to 2012. National Climate Assessment, https://nca2014.globalchange.gov/.

Needs to be Addressed –

High Renter Occupancies + Low and Medium Income Areas

Tree Planting & Care

Site Selection

Credit: https://floridatreescapes.com/know-your-purpose-for-planting-a-tree/

Oval Shape

70′
fully grown

50′
fully grown

Full Sun
8-12 hours

Medium
medium moist soil

Growth Rate
moderate/fast

NORTHERN CATALPA

Catalpa speciosa

Facts

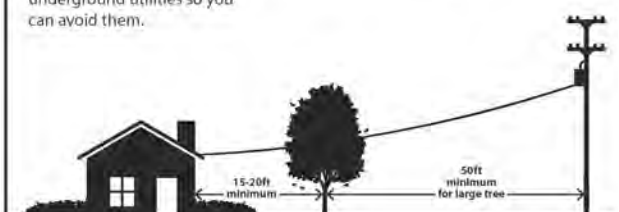
Northern catalpa is a show stopper known for its bell-shaped flowers in the spring and large ovate-oblong leaves. Flowers give way to long slender green seedpods that then mature in the fall to dark brown. Growing into an irregular oval crown makes for a beautiful statement tree. Bark will gradually fissure and giving way to a ridged pale gray-brown texture. Common places to find catalpa are along streams, bluff bases in both low and upland woodlands.

Know What's Below

To remain safe while planting trees, shrubs or flowers, **call 811 at least two days before digging**. Workers will visit your property to mark the location of gas lines or other underground utilities so you can avoid them.

Right Tree – Right Place

By calling 811 and planning before digging, this helps to ensure the safety and resiliency of your tree and home. Proper tree selection and placement can enhance property value and prevent potential maintenance damage to your property and surrounding utilities.



SPRING BLOOM June

AUTUMN COLOR Yellow

HOW NEAT! Slender seedpods

Plan before you plant

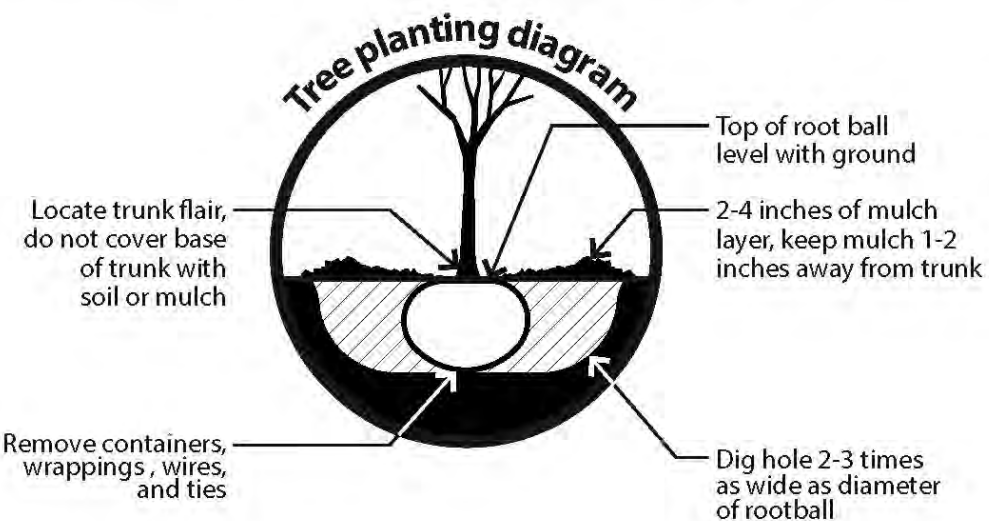
Large trees (40+ feet or taller) should be planted no closer than 50 feet horizontally to power lines. It is also recommended to plant at least 20 feet away from your home.

Call before you dig

Call 811 at least 2 days before planting. Make sure you properly plan for mature growth of your tree by following "The Right Tree in the Right Place" guidelines.

Why mulch?

Mulching your tree with wood chips or other organic matter helps the tree hold moisture, moderates soil temperature extremes and reduces grass and weed competition.



FREE mulch locations

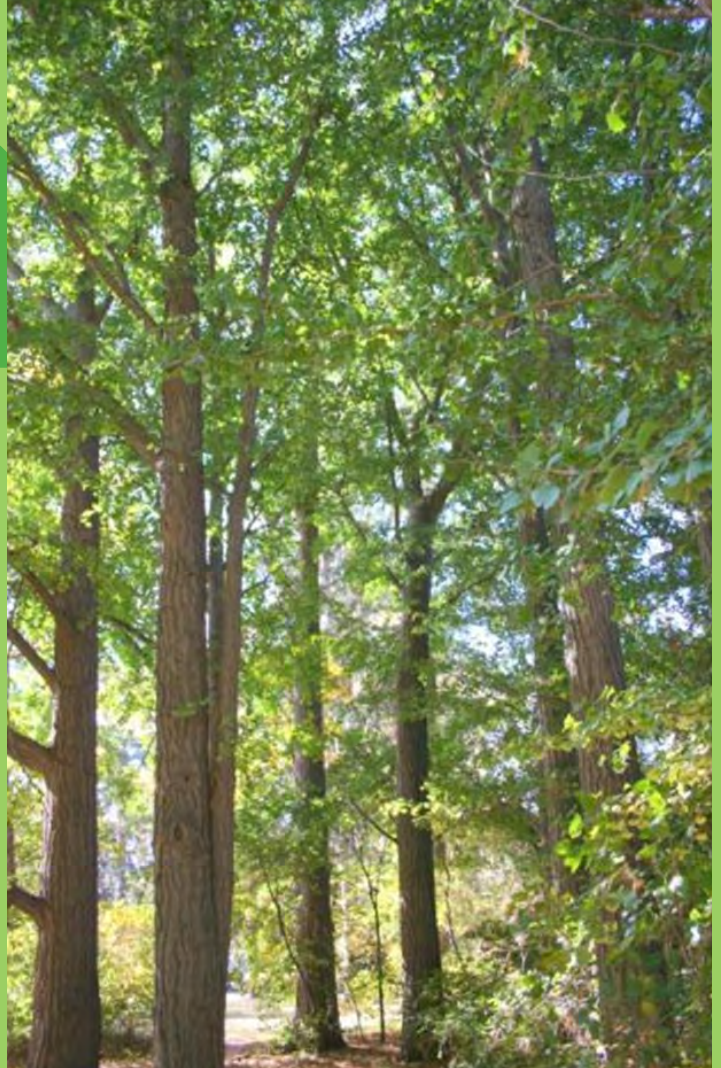
Bowling Lake Park - parking lot
Oak Lake Park - parking lot
Holmes Lake Park - parking lot
Flemming Fields - parking lot

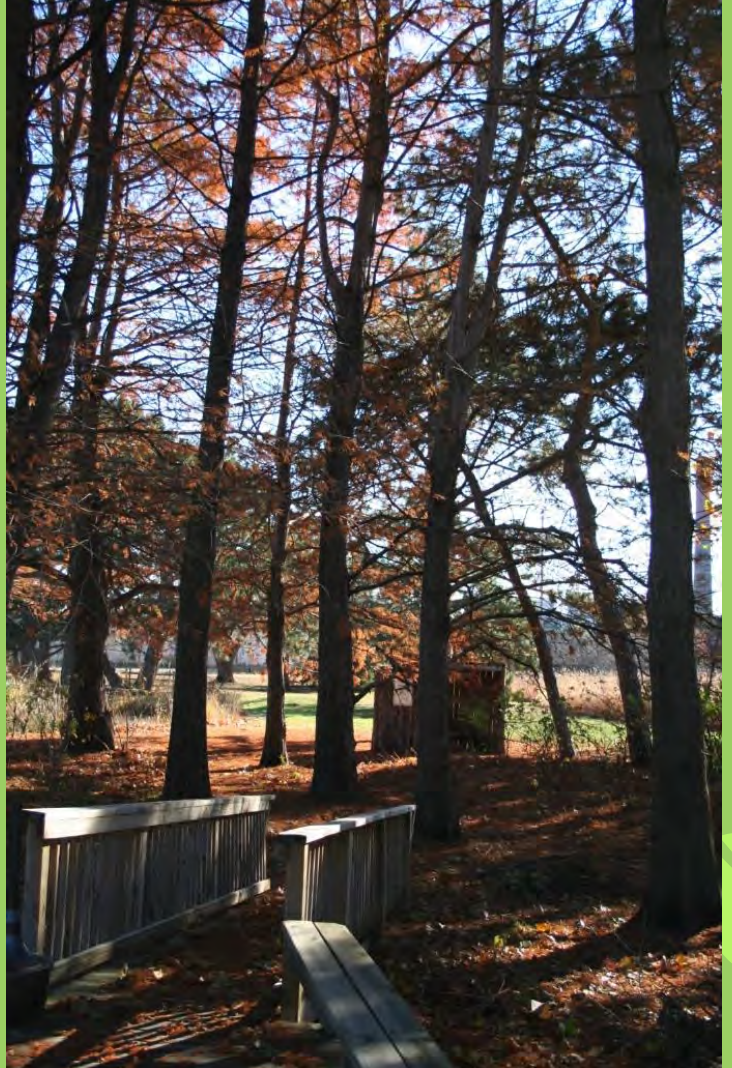
Follow-up care

Water trees at least once a week (unless it rains) keeping soil moist, but not water logged. Water more frequently during hot, windy weather.

Site Selection

- Trees like growing in groups.
- Consider planting a grove of the same tree versus a single tree in the same area.
- Trees share root space, nutrients, compete for light and better resist wind storms and ice breakage.





Plants and soil fungi are involved in mutually beneficial relationships

The fungi, called mycorrhiza explore a large volume of soil and extend away from the plant root.

A single fungal individual can connect to many different plants at the same time, creating fungal nutrient highways through the soil profile.

Site Selection

Put trees in a landscape bed

Site Selection

Let trees and plants work together

Planting Timing

Spring

- Growth – new leaves & roots
- Water needed for growth, but limited root system
- Some leaves may drop to conserve water resources

Fall

- Growth – time for new root growth in fall & spring
- Roots grow best in cool soil
- Lower water demands

Summer planting – is much harder on the tree and is not recommended.

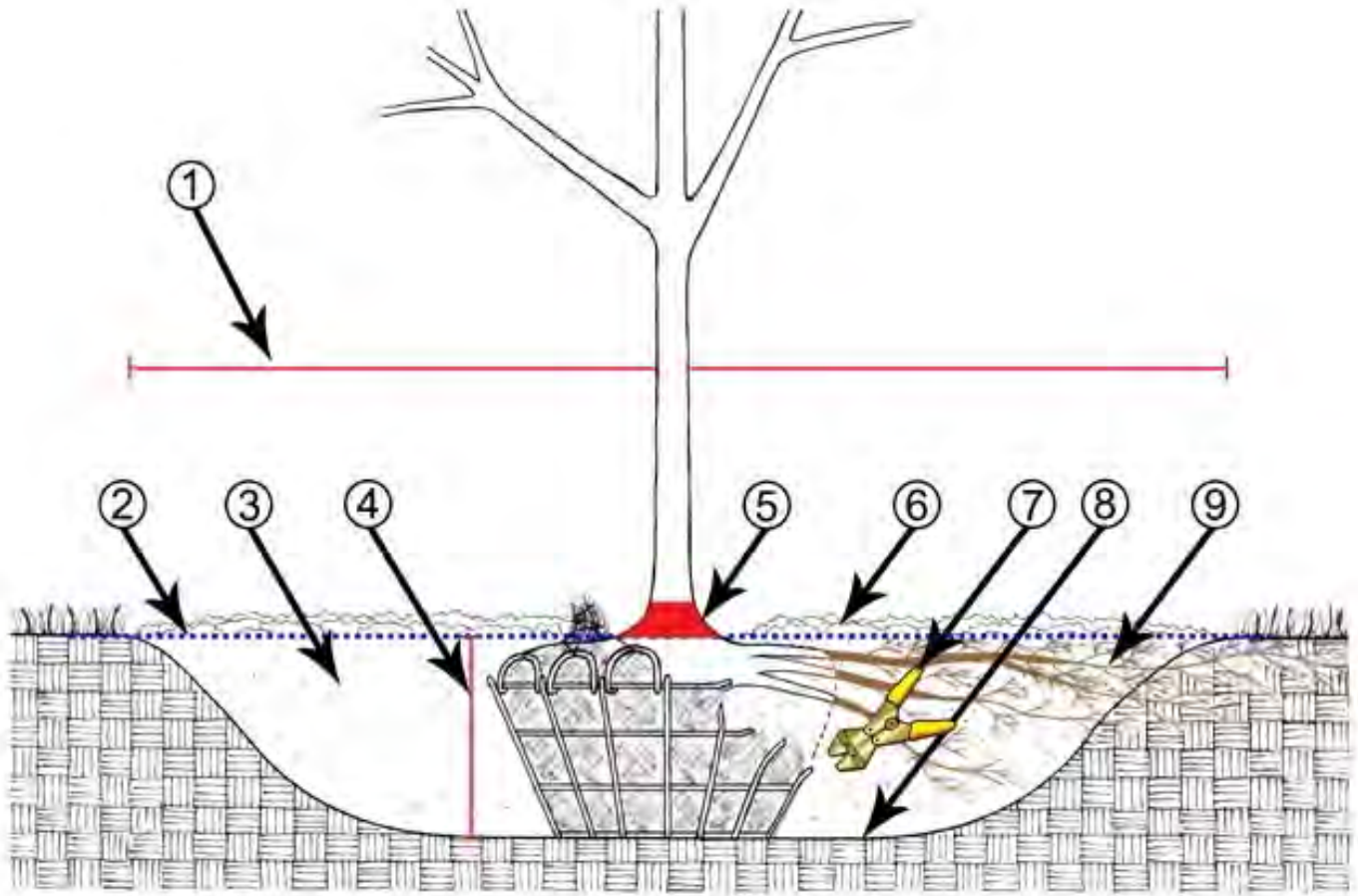
Planting Time by Tree Type

Deciduous

- Lose their leaves in fall, so water needs are vastly reduced
- Growing roots still require water, but that is a small amount compared to leaf water needs.

Evergreens

- Hold leaves/needles all winter.
- Metabolism is reduced, but water loss continues.
- Frozen soil - roots have trouble getting the water they need
- Brown/dead needles in spring.



1. Hole width equals 2 to 3 times the width of the root ball at surface
2. Existing soil surface (blue dotted line)
3. Amended soil
4. Hole depth equals base of root flare to bottom of root ball
5. Root flare above soil surface (shown in red)
6. 2" - 3" layer of mulch; keep away from trunk
7. Cut away the upper one half of the wire basket
8. Firm ground
9. New root growth

Enlarging the top of the hole two to three times that of the root ball diameter increases the amount of loose, backfill soil near the surface where conditions are favorable for root growth. On wet sites, a tree can be planted so that one-third of the root ball is above the original grade. This method will keep most of the root system above the saturated soil even during very wet periods.


Soil amendments can be mixed into the top 6 inches surrounding the planting hole
One cubic yard will cover approximately 100 square feet with 3 inches of material

7 Ways to Create a "Natural" Environment for Tree Roots

1. Establish a "Litter Layer"
2. Create Conditions for Vigorous Root Growth
3. Avoid Root Damage
4. Plant it Right!
5. Avoid Grass Competition
6. Manage Nutrients
7. Match the Tree to the Site

Avoid Grass Competition

Grass Competes With Trees For Nutrients & Water, & Releases Growth Inhibiting Chemicals


TORO

Watering New Trees

Water is the most critical need of newly planted trees.

It’s more important how often you water (frequency) versus the duration of the watering (amount of water). More frequency, less duration!

It’s more effective to water a tree 2 times a week with a 5 gallon bucket of water versus 1 time a week with 10 gallons of water.

Watering New Trees

How often newly planted trees are watered depends on the weather conditions at the time.

Water new trees based more on frequency than duration—in other words, water the tree often, with a limited amount of water.

For most large trees 5-10 gallons of water per week is adequate in their establishment.

For smaller trees, 1-2 gallons of water per week is adequate.

Watering Established Trees

- To water mature trees, avoid a common mistake — watering only near the trunk.
- Trees do not have tap roots, but instead have a root system that extends out from the tree, more or less mirroring and extending just past, the tree's branches above.
- So, when you set out your hose or set up a drip or soaker system, begin near the trunk, and then work your way out to the edges of the tree's canopy.

Soil moisture is especially important during the first three years following transplanting.

One inch of water each week for the first season is a good rule of thumb, monitoring soil moisture and applying water as needed is preferable.

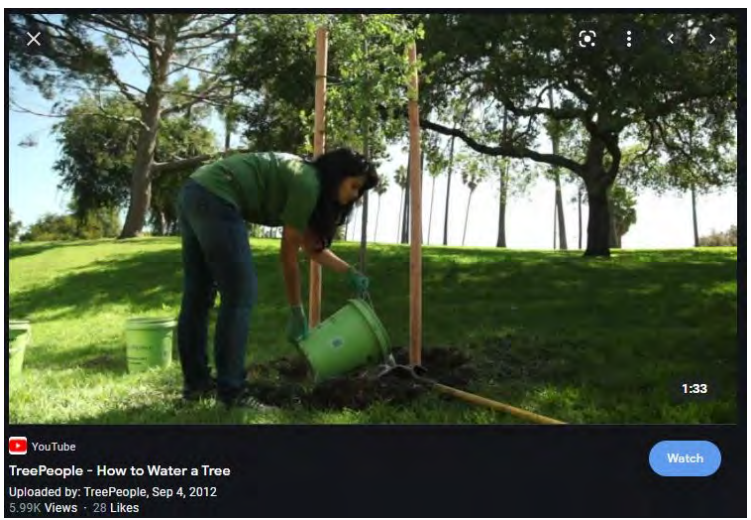
Ensure Roots Have Oxygen

- Avoid excessive watering
- Remember, over-watering can reduce soil air space, lowering oxygen availability, and that can be just as stressful as drought.

Watering – Don't!

- Washes away the soil
- Too harsh
- Not a deep watering

Watering – Do!



https://www.youtube.com/watch?v=J29E82DWM2g

Slow release with a tree bag

Keeping Older Trees Healthy

Protect Tree Roots

- Compacted soil is one of the biggest threats to tree roots because compaction impedes water infiltration and oxygen into the root zone.
- Focus on protecting the roots and soil within the critical drip line—root zone of your tree.

Water Effectively

- Mature, well-established trees will likely thrive in existing soil and moisture conditions.
- Maintain your tree's health with healthy soil to give it the best chance of surviving a drought.
- Summer heat & drought is when a tree may need to be irrigated.
- Infrequent, deep watering is the preferred schedule for trees.

Maintain Healthy Soil Around Trees

In the Forest

- In the forest, trees do just fine on their own without human care.
- Has an intact layer of decaying organic matter.
- Retains soil moisture and creates good soil structure for water infiltration.

In Your Landscape

- Mulch with purchased mulch or fallen leaves.
- 2 to 4-inch layer.
- Keep the mulch away from the trunk and root flare.
- Plant shade-tolerant ground covers and grasses.

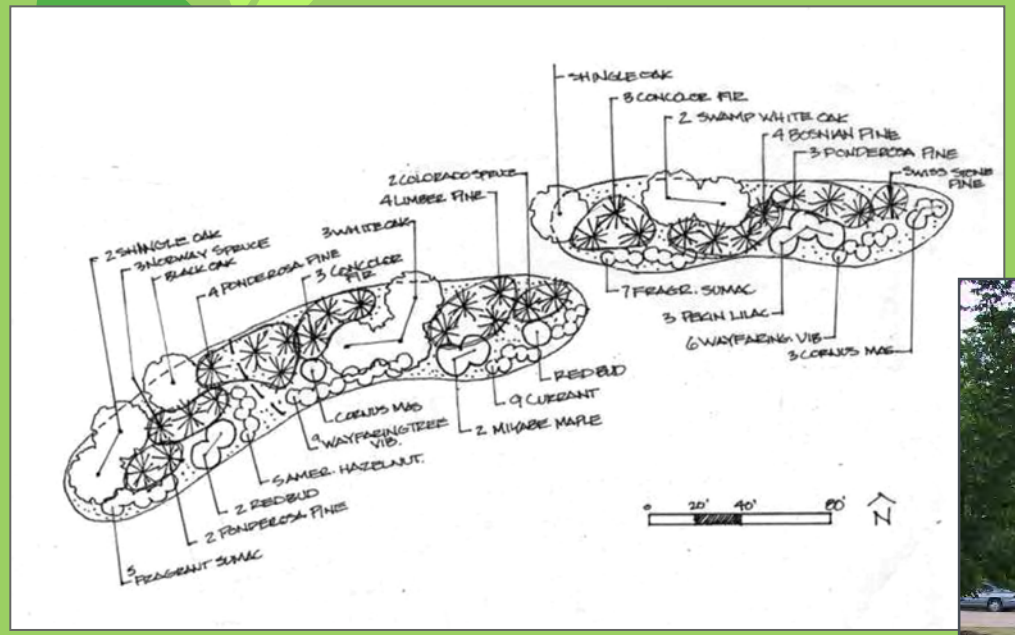
Establish a Litter Layer With Organic Mulches

- Conserves moisture
- Can reduce soil pH
- Fosters microbial growth
- Re-establishes nutrient cycling
- Reduces soil temperature extremes
- Avoids grass competition
- Reduces mower damage

Mulching do's

The Case Against Mulch Rings

Sample Massing Plan



Create a tree root zone!

The key to amending clay soil over time is to cover a large area with a light layer of compost and organic mulch.

The Community Tree Canopy with Lincoln Parks & Recreation

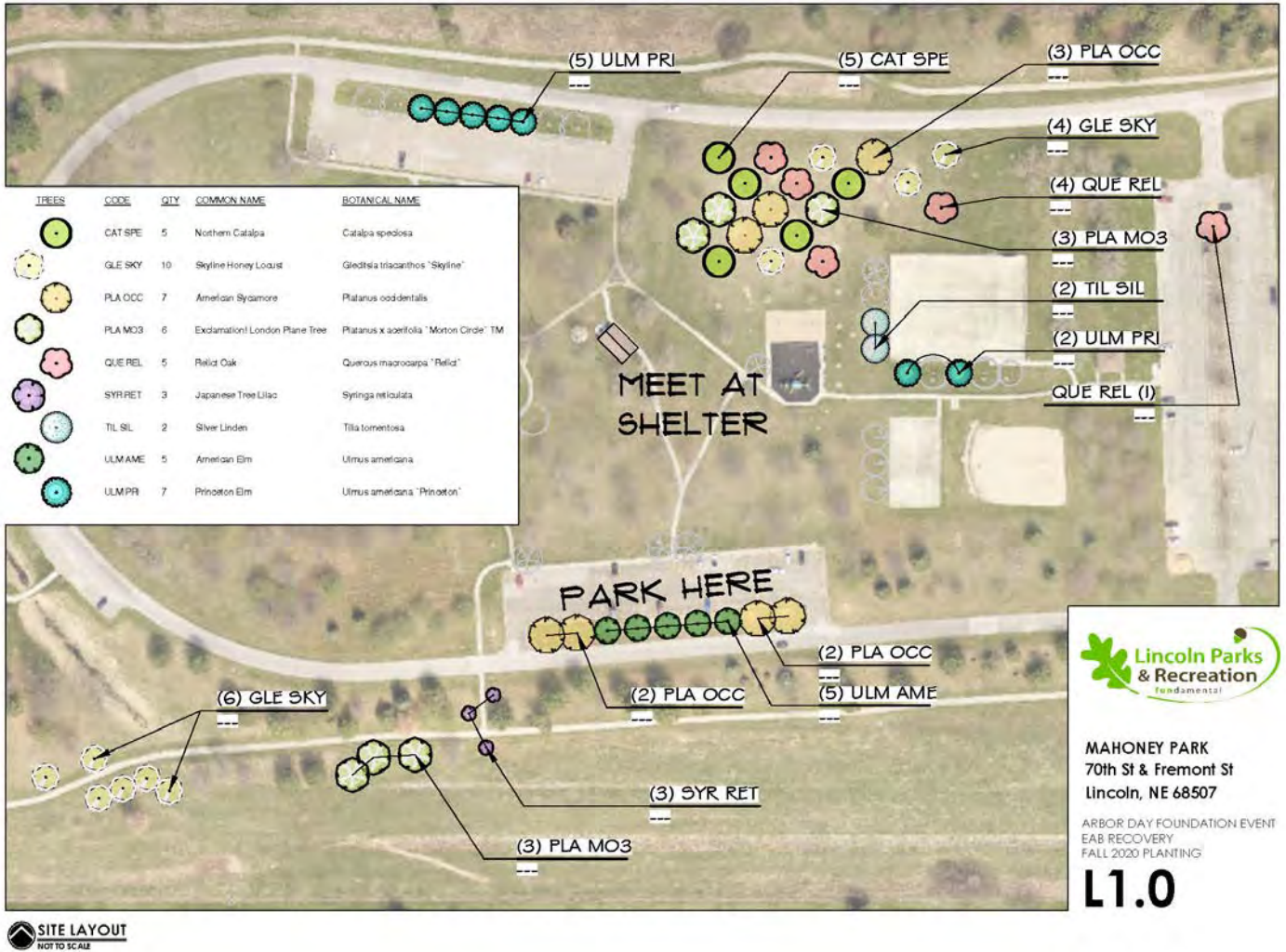
How to contribute to the growth of our shared urban and park tree canopy

Community Tree Donations/Involvement

- Lincoln Parks Foundation
- 2 for Trees
- Adopt an Ash
- Pilot Grant Program for LMI
- Prairie Pruners
- Volunteer Opportunities

Volunteer Opportunities

Volunteer Tree Planting Mahoney Park



TREES	CODE	QTY	COMMON NAME	BOTANICAL NAME
	CAT SPE	5	Northern Catalpa	Catalpa speciosa
	GLE SKY	10	Skyline Honey Locust	Gleditsia triacanthos 'Skyline'
	PLA OCC	7	American Sycamore	Platanus occidentalis
	PLA MO3	6	Exclamation! London Plane Tree	Platanus x acerifolia 'Morton Circle' TM
	QUE REL	5	Relict Oak	Quercus macrocarpa 'Relict'
	SYR RET	3	Japanese Tree Lilac	Syringa reticulata
	TIL SIL	2	Silver Linden	Tilia tomentosa
	ULM AME	5	American Elm	Ulmus americana
	ULM PRI	7	Princeton Elm	Ulmus americana 'Princeton'

Volunteer Planting at Mahoney Park

Volunteer Tree Care Opportunities

Thanks!

ANY QUESTIONS?

You can find us at

- Sarah Browning, sarah.browning@unl.edu
- Bob Henrickson, rhenrickson2@unl.edu
- Kaylyn Neverve, kneverve@lincoln.ne.gov