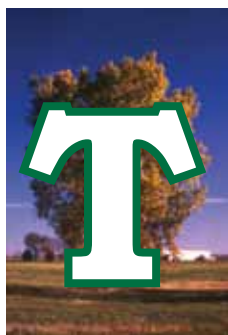




Tree Identification Manual

A Guide to Trees in Nebraska



Tree Identification Manual

Revised by Dennis Adams, Forester, University of Nebraska–Lincoln, Institute of Agriculture and Natural Resources

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On the cover: *The cover photo shows the state tree of Nebraska, the cottonwood.*

Foreword

The obvious purpose of this publication is to teach youth how to identify trees, but the broader intent is to create an awareness and appreciation of our natural resources, including the importance of trees to the social, economic, and environmental fabric of society.

Acknowledgments

This is a revision of the Tree Identification Manual written by former Nebraska State Extension Forester, Michael Kuhns, and published in 1987.

Most of the illustrations in this manual were originally drawn by Charles Herbert Otis and appeared in *Michigan Trees: A guide to the trees of Michigan and the Great Lakes Region* by Burton V. Barnes and Warren H. Wagner, Jr., published in 1981 by the University of Michigan Press, which owns the copyrights.

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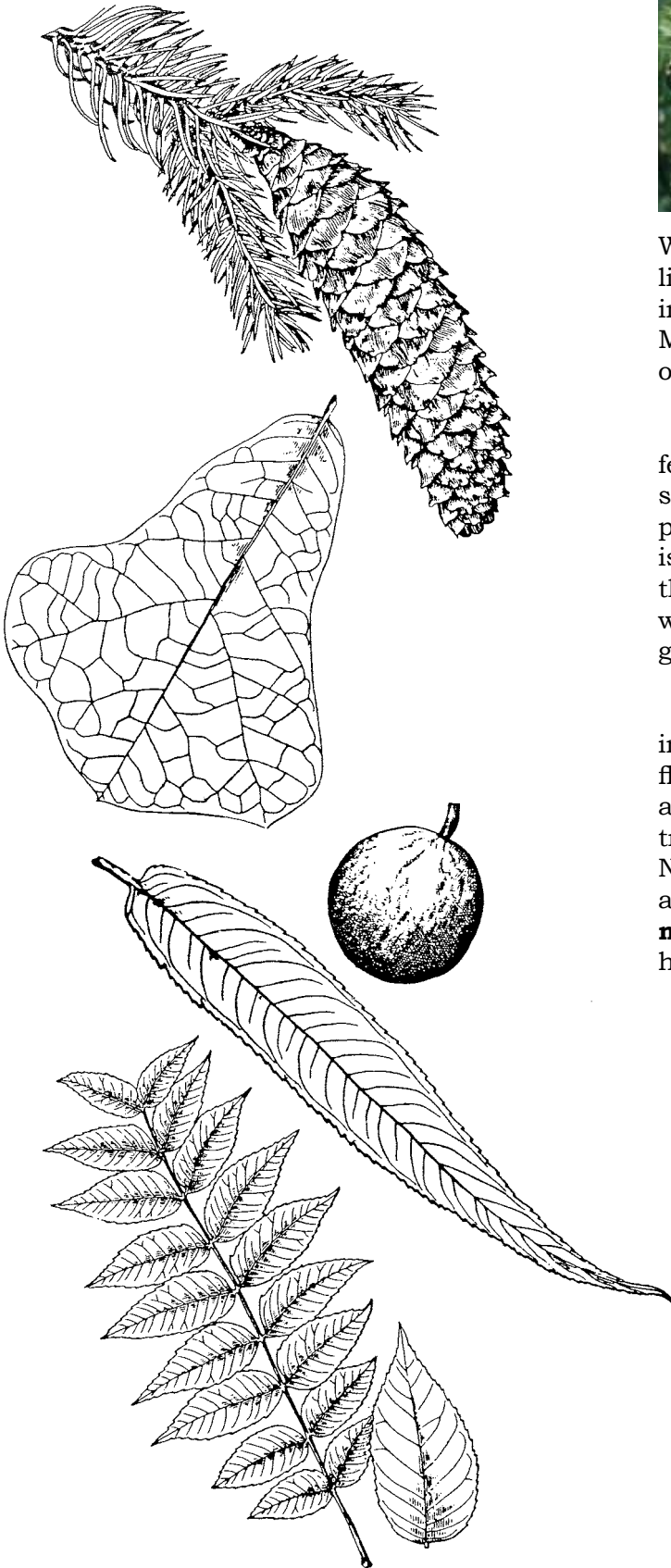
ntroduction

Trees are a valuable natural resource. They provide a multitude of benefits, including wood, food, wind protection, shade, and beauty.

Without trees the landscape would be bleak and our lives less enjoyable. Tree planting and care has been important to Nebraskans since the days of J. Sterling Morton, the famous Nebraska politician and founder of Arbor Day in 1872.

Each **species**, or individual type of tree, has differing needs for water, light, nutrients, and soil. The study of trees and their interaction with all other plants, animals, and nonliving organisms in the forest is called **forest ecology**. However, before we can select the best trees to plant, or to properly manage a forest, we need to know how to identify tree species and the growing conditions they prefer.

This manual describes 60 common tree species in Nebraska. You will learn how to compare leaves, flowers, fruit, bark, and other parts of a tree and use a **dichotomous key** to identify species. Most of the tree species included in this manual are **native** to Nebraska, meaning they occur here naturally. Some are **introduced**, but grow well in Nebraska. A few are **naturalized**, which means they were introduced, but have escaped cultivation and are growing in the wild.



Illustrations from Barnes and Wagner: Michigan Trees.



ree Parts

Leaves

The leaves of most living plants, including trees, manufacture food for the plant by a process called **photosynthesis**. During this process the green chlorophyll in the leaves uses light energy from the sun, carbon dioxide from the air, and water from the soil to make sugars, or food, for the tree. These sugars sustain all the metabolic processes for the tree to survive, grow, and reproduce. Oxygen, which is required by all animal life, is given off as a byproduct of photosynthesis.

Shade Tolerance. Some tree species are more efficient at photosynthesizing under low light intensity. They are called **shade tolerant** and often they have large, thin leaves to capture the reduced light in the understory of a forest. Examples include basswood, hackberry, sugar maple, and redbud. **Shade intolerant** trees require direct sunlight. They are usually the first to colonize unshaded, open areas and are therefore known as **pioneers**. Examples include cottonwoods, willows, birches, and pines. Tolerant species begin to appear after a forest of intolerant species matures.

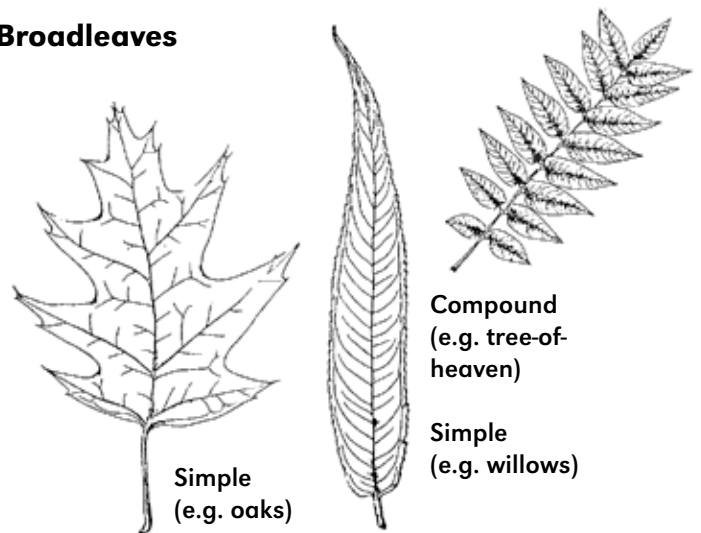
Persistent or deciduous. A tree's leaves either remain on the tree, and green, through the winter (**persistent or evergreen**) or die and fall off in autumn (**deciduous**). Most broadleaf trees in northern climates, like Nebraska's, are deciduous. Sometimes a deciduous tree's leaves will die in autumn, but remain on the branch through most of the winter. An example is pin oak.

Leaf Type. Tree leaves are categorized into four general leaf types: **needle-like, scale-like, awl-like, and broadleaf**.

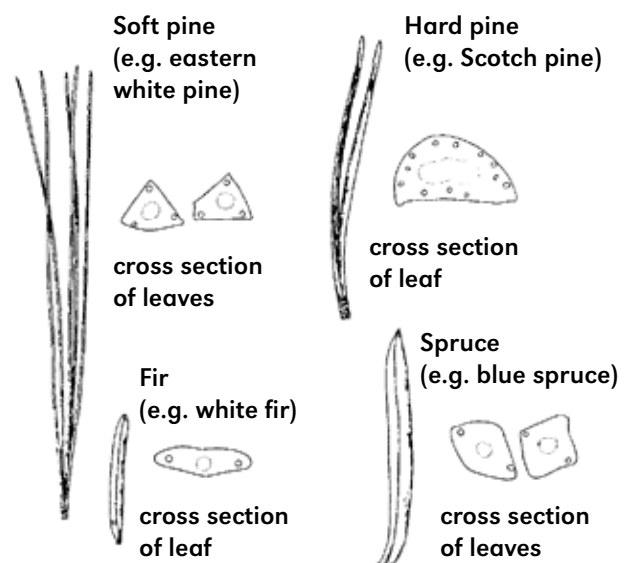
Needle-like leaves are displayed on most conifers (gymnosperms) other than the cypress family. Pine needles are always sheathed in bundles of two to five. Hard pines have needles in bundles of two or three with a scaly sheath around the base. Soft, or white pines, always have five needles per bundle without a scaly sheath. Spruces, true firs, Douglas-fir, and most other conifers display single needles. The needles of true firs and Douglas-fir are flat in cross section. The needles of spruces are diamond-shaped in cross section.

LEAF TYPES

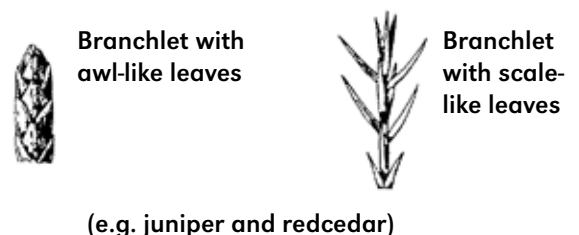
Broadleaves



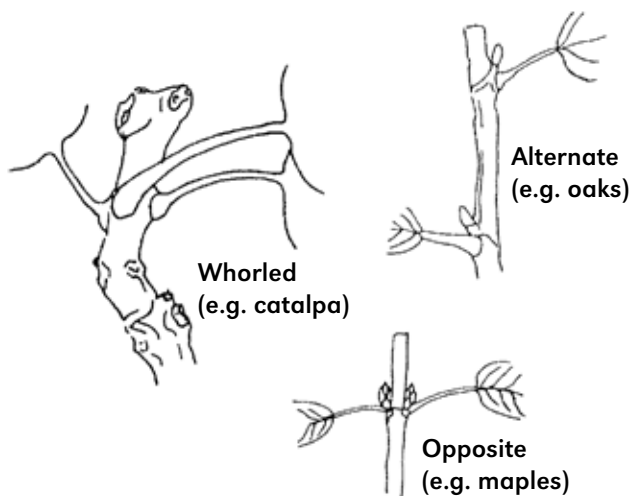
Needle-like



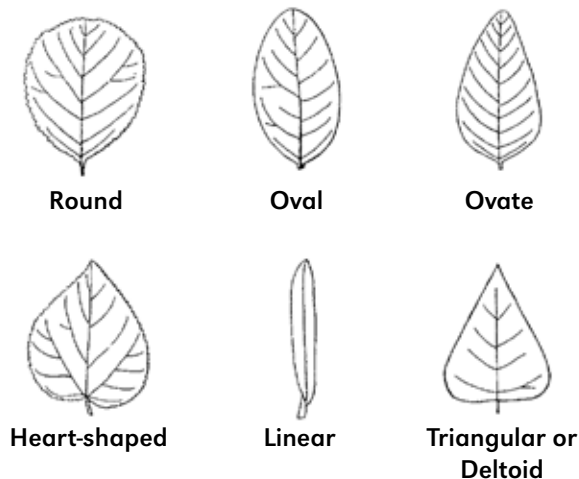
Scale-like, Awl-like



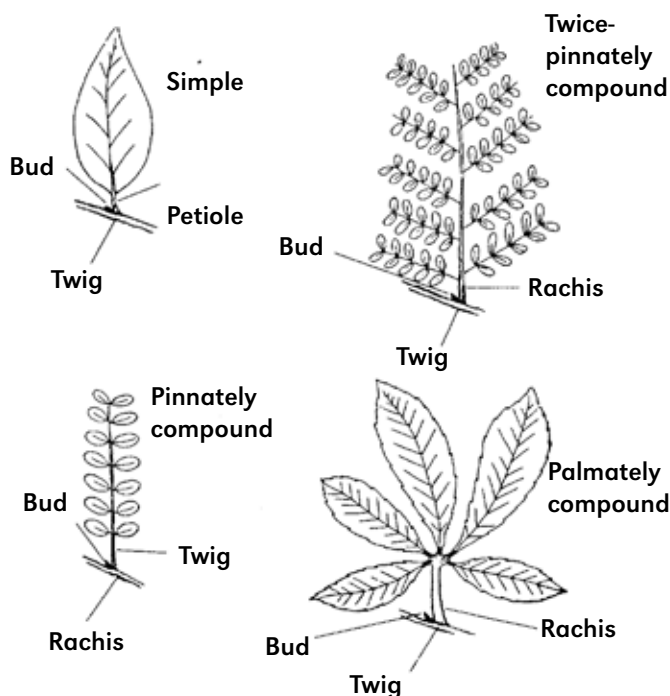
Leaf Arrangement



Leaf Shape



Leaf Composition



Scale-like or **Awl-like** leaves are found on junipers and cedars. Younger twigs generally have scale-like leaves while older twigs and branches may have awl-like leaves. Both awl-like and scale-like leaves are found on junipers.

Broadleaves are characteristic of hardwood trees (angiosperms). Although the name broadleaf implies a wide leaf, these trees actually have leaves ranging from very wide, e.g. sycamore, to very narrow, e.g. willow. One species described in this manual is an exception. Ginkgo, unlike most other gymnosperms, has broad, flat-bladed leaves.

Leaf Arrangement: Conifer leaves are arranged either spirally or opposite each other on a twig. Broadleaves are arranged either **opposite** each other on a twig (two at each node or point of attachment), **alternate** (one at each node), or **whorled** (more than two leaves at each node, usually three). Most broad-leaved tree species have alternate leaves. One way to remember the common species that have opposite leaves is to remember “MAD Buck,” which stands for **Maple**, **Ash**, **Dogwood**, and the **Buckeye** (horsechestnut family).

When the leaves are on the tree, the leaf arrangement can be determined by tracing the leaf stalk or **petiole** back to where it is attached to the twig. There will be a bud at this point on all but new growth, although the bud may sometimes be hidden under the base of the petiole. If leaves have fallen off, look at the arrangement of leaf scars and buds on the stem.

Leaf Shape: Leaf shape is sometimes a good indicator of a species, but can be variable, depending on stage of leaf development, amount of shade, and genetic variation in the tree species.

Leaf Composition: Broadleaves are classified as **simple** or **compound**. **Simple** leaves have one blade attached to a **petiole** or stalk. **Compound** leaves have multiple **leaflets**, or small leaf blades, attached to a stalk or stalks. The central stalk attached to the twig in a compound leaf is called a **rachis**. Compound leaves are either **palmately compound**, **pinnately compound**, or **twice-pinnately compound**.

You can tell a leaflet of a compound leaf from a simple leaf by looking at the point where it attaches to the stalk or stem. If a bud is found, it is a whole leaf. If there is no bud, it is a leaflet. You also can look at which part of the leaf falls off in autumn (look on the ground under the tree). While entire leaves generally come off the tree in fall, the stalks of some compound leaves, for example black walnut, may not fall until mid to late winter.

Leaf Margins: Margins or edges of leaves are either **entire** or smooth, **lobed**, or **toothed**. Toothed leaves, sometimes called **serrate**, can be coarsely or finely serrate, singly or doubly serrate (teeth on teeth), and can have sharp (pointed or angled) or blunt (rounded) teeth.

Leaf Tips and Bases: The shape of leaf tips and bases are very useful characteristics to help identify a particular tree species.

Leaf Surfaces: Leaf surfaces can be described as hairy (pubescent), rough, smooth (glabrous), shiny (lustrous), scaly, or waxy. The top surfaces of leaves are often different from the bottom surfaces.

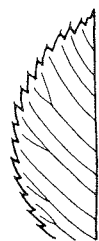
Twigs

Twigs are the smallest branches of a tree and display the leaves. Twigs can be described as rough, smooth, hairy, shiny, ridged, straight, zig zag, or waxy. The **pith**, the tissue in the middle of a twig, may be **chambered** or **solid**, and sometimes distinctly colored.

Buds

Buds contain the embryonic leaves and twigs that will emerge and grow next year. There are also flower buds, but they are not discussed here. Buds can be **terminal** (at the twig tip) or **lateral** (on the side of the twig). Some tree species like hackberry and redbud do not have terminal buds. Oaks have several buds clustered around the twig tip. Some lateral buds may be hidden under the base of the petiole, as in sycamore.

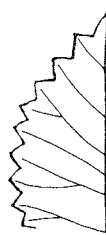
Leaf Margins



Serrate
(toothed)



Double-
serrate



Dentate



Crenate



Undulate



Sinuate



Lobed



Smooth
(entire)

Leaf Tips



Acuminate



Acute



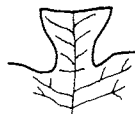
Obtuse



Emarginate



Macronate



Flat

Leaf Bases



Cuneate



Acute



Unequilateral



Rounded



Subcordate



Flat



Cordate

Twigs

Pith

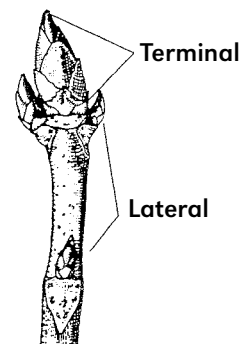


Solid



Chambered

Buds



Terminal

Lateral

Flowers

Flowers are the reproductive parts of a tree. Many trees, like elms, have flowers that are small and inconspicuous. Others, like magnolia, have large, showy flowers. Tree flowers are usually functional for a short time during the year. Some vegetatively propagated varieties may not bear flowers and fruit at all. The usefulness of flowers for identification of trees is, therefore, limited. However, plants are ultimately classified by flower structure and some species do have conspicuous flowers, so some knowledge of flowers is useful.

This manual primarily describes the sexual characteristics of flowers, but floral descriptions are included for a few trees with unique or showy flowers.

Flowers that have both male (**stamen**) and female (**pistil**) actively functioning sexual organs are **bisexual** and are called **perfect flowers**. Perfect flowers are typical of the elm, magnolia, rose, linden, and several other families. If a flower lacks either functioning stamens or pistils, it is **imperfect** or **unisexual**. Unisexual flowers can be either **staminate** (male) or **pistillate** (female). When a species has only unisexual flowers, and both staminate and pistillate flowers are found on the same tree, that species is called **monoecious** (for the Greek "one house"). Monoecious families include pine, walnut, birch, oak, and others. **Dioecious** ("two houses") species have staminate flowers on one tree and pistillate flowers on a separate tree, as in the willow and mulberry families. If both perfect and imperfect flowers are found on the same tree, the species is called **polygamous**. **Polygamo-dioecious** species have unisexual flowers, with staminate and pistillate flowers borne on different trees, but also have some perfect flowers on each tree. Examples are honeylocust and Kentucky coffeetree. **Polygamo-monoecious** species have staminate and pistillate flowers on the same tree, along with some perfect flowers on each tree, as in hackberry.

Knowing floral characteristics is useful for tree identification and selection. With this knowledge, you will know which species have male-only trees, female-only trees, or whether they bear fruit (only trees with female or perfect flowers bear fruit).



Fruits

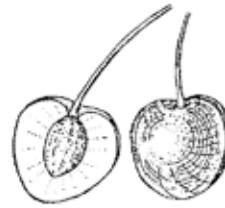
Fruits develop from flowers with female parts and are the seed-bearing organs of a plant. They can be very helpful for tree identification. Examples of several angiosperm fruit types are:

1. **drupe** — fleshy with a single stone or pit (example: black cherry).
2. **berry** — fleshy with several seeds (example: pawpaw, persimmon — not shown in this manual).
3. **pome** — fleshy with a papery, walled inner chamber containing several seeds (example: apples).
4. **legume** — dry, elongated pod that splits, revealing several seeds along one edge (example: honeylocust, eastern redbud).
5. **capsule** — dry fruit that splits to reveal many seeds inside (example: catalpa).
6. **achene** — small, dry, and hard one-seeded fruit (example: sycamore is actually a composite of hundreds of achenes).
7. **samara** — one or two flat wings attached to a seed (example: maples, elms, ashes).
8. **nut** — hard, with an outer husk that does not split open readily and an inner papery or woody shell (example: black walnut).
9. **acorn** — nut-like fruit with a scaly or warty cap (example: all oaks).

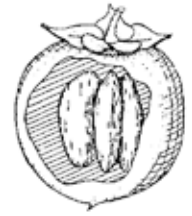
Bark

Bark is the outer protective covering on the trunk, twigs, and roots of a tree. The outer part of the bark is dead. New bark is constantly being made on the inside and pushed out. This is why older trunks usually have rough outer bark that peels or flakes away. Young trees of most species have fairly smooth bark. To see what a tree's bark looked like when it was young, look at the bark on upper branches and twigs. Bark is highly variable. Some tree species, like sycamore, white poplar, and Scotch pine, can be easily identified by their bark characteristics.

The **inner bark**, or **phloem**, is the living spongy tissue that moves food throughout the tree. It continually grows out and dies to form the **outer bark**. Just inside phloem, but outside the wood, is a single layer of cells called the **cambium**. When cambium cells divide, they form new cells to the inside that become wood and to the outside that become phloem and bark.



Drupe
(e.g. black cherry)



Berry
(e.g. persimmon)



Pome
(e.g. apples)



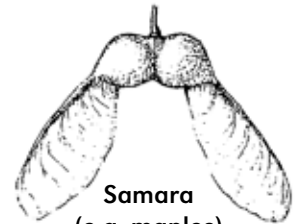
Legume
(e.g. eastern redbud)



Capsule
(e.g. catalpa)



Achene
(e.g. American sycamore)



Samara
(e.g. maples)

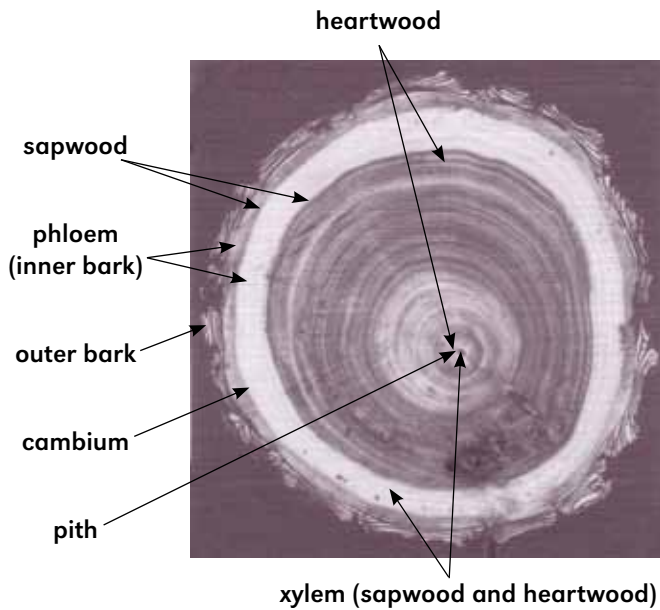


(e.g. pin oak)



Nut
(e.g. Black walnut)

Cross section of an American elm trunk



Wood

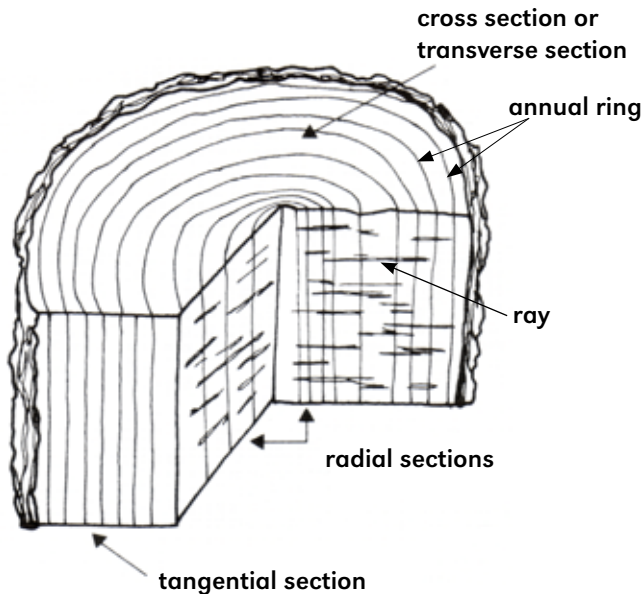
The wood, also called **xylem**, is the tissue inside the cambium on a tree's trunk, branches, twigs, and roots. Wood is made up of **fibers** for strength and hollow tubes of different sizes and types that, like straws, conduct water from the roots to the leaves. Most of the larger tubes are called **vessels** and look like pores in the cross section of cut wood. Smaller tubes are called **tracheids**, which are too small to be seen by the naked eye.

Wood Sections: Wood looks different depending on how it is cut and which face is exposed. A **cross section** or **transverse section** exposes growth rings in circles when a log is cut straight across. A **radial section** is exposed when a log is cut lengthwise straight through the center of the log. Cutting in the same lengthwise direction, but not through the middle, exposes a **tangential section**.

Sapwood and Heartwood: Each year as a new annual ring is added by the cambium to the outside of a tree's stem, some of the wood in the middle of the tree dies and becomes **heartwood**. Heartwood is often filled with dark-colored extractives that help resist decay. The active, living, usually light-colored wood to the outside of the heartwood is called the **sapwood**, which is responsible for water movement longitudinally through the stem and branches. Sapwood may be one to many growth rings wide.

Rays: The ribbon-like bands of tissue that move water and other substances radially through the wood are called **rays**. They may connect with the pith or phloem. Rays may be large and easily seen, as in the oaks, or small and hard to see, as in cottonwood. They show up best in cross sections and radial sections.

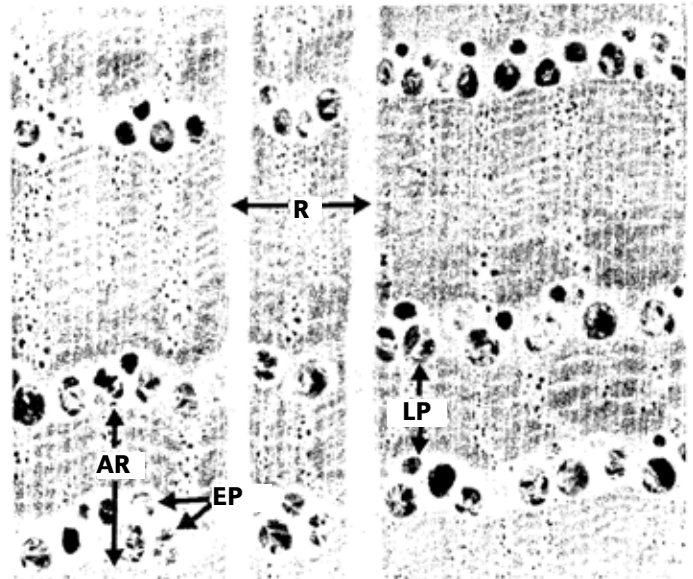
Cross section of a typical tree trunk



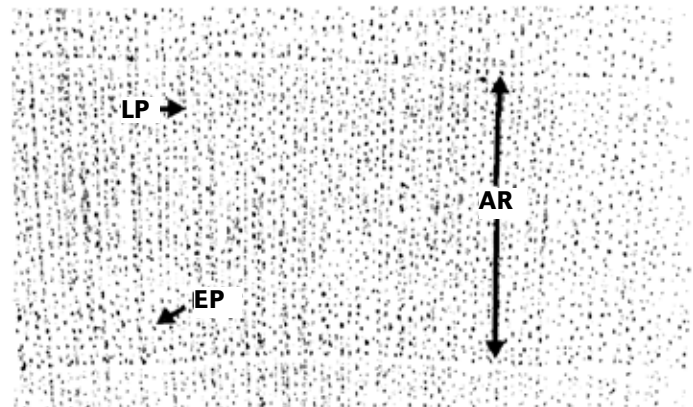
Softwoods and Hardwoods: Trees can be divided into two general classes: **softwoods** and **hardwoods**. Softwoods is another name for **conifers**, or cone-bearing trees, like pines, spruces, or firs, which generally have soft, light wood. The wood from softwood trees is sometimes called **nonporous** because it has no large vessels, only very small tubes, or tracheids, that cannot be seen easily. Hardwoods, also called **broadleaves**, include trees such as elms, ashes, oaks, and cottonwood. They are often called **porous** woods because their wood is mostly made up of vessels that appear as pores or holes in a cross section. Some hardwood trees, such as cottonwood, actually have softer wood than some softwood trees, such as Douglas-fir.

Annual Rings: As a tree grows, a new layer of wood is produced each year. Each annual increment of wood is called a **growth ring**, or **annual ring**. Growth rings are added in relatively concentric circles around the center, or pith, of a stem or branch. When growing conditions are favorable, growth rings are usually wide. When growing conditions are poor, growth rings are narrow. The inner part of an annual ring is formed early in the year and is called **spring-wood**. Spring-wood generally has larger, thin-walled vessels or pores and may be lighter in color. **Summer-wood**, on the outer part of the annual ring, has smaller, thick-walled pores or vessels packed close together. Color is often darker.

Ring-Porous and Diffuse-Porous: Wood of broadleaved trees can be classified as **ring-porous**, **diffuse-porous**, or **semi-ring-porous**. Ring-porous wood has vessels or pores that are much larger in the spring-wood than in the summer-wood. Examples of ring-porous woods include oaks, ashes, and elms. Diffuse-porous wood has spring-wood and summer-wood vessels very similar in size, as in eastern cottonwood or black willow. Semi-ring-porous woods are somewhere between ring-porous and diffuse-porous, such as in black walnut or black cherry.



Cross section of a ring-porous hardwood (oak) at 10x magnification showing one annual ring (AR) containing large earlywood pores (EP), small latewood pores (LP), and large rays (R).



Cross section of a diffuse-porous hardwood (maple) at 10x magnification showing no difference in earlywood (EP) and latewood (LP) pores. Annual rings (AR) are not as distinct as in ring-porous hardwoods.



ree Classification

Taxonomy is the science of classifying all living organisms on earth. Although taxonomy is continually evolving, the taxonomic classification system described here is based on a theory of plant evolution by Cronquist (1981). For illustration, the following is the taxonomic classification sequence for the state tree of Nebraska — eastern cottonwood.

- Kingdom *Plantae* (Plants)
- Division *Magnoliophyta* (Angiosperms or Flowering Plants)
- Class *Magnoliopsida* (Dicotyledons)
- Order *Salicales* (Willow Order)
- Family *Salicaceae* (Willow Family)
- Genus *Populus* (Poplars)
- Species *deltoides* (eastern cottonwood)

Taxonomic classifications are sometimes subdivided, e.g. Subdivision or Subclass, but the classification is always more specific toward the bottom. For example, many organisms belong to the same Kingdom, fewer belong to the same Division, fewer still to the same Class, and so on down to Species, which is the most specific classification.

A particular type of tree is called a **species**. Although the word “species” ends in an “s”, the tense of the word is both singular and plural. Trees of the same species have very similar fruits, flowers, and other parts. We know most trees by their **common names**, such as “white poplar” or “cottonwood.” These names are useful, but the same species may have more than one common name, depending on local custom. For example, white poplar is also called silver poplar and sometimes even silver maple. Osage-orange is also known as hedge or bodark. Ironwood is a common name for eastern hophornbeam, American hornbeam, and several other species with very hard wood.

Because of local variations in tree names, standard names were established using Latin words. These **scientific names** are used worldwide to describe a certain species. For example, the scientific name for northern red oak is *Quercus rubra*. Scientific names are always underlined or italicized. The first word in our example, *Quercus*, is the **genus** of the tree. A genus (plural **genera**) is a broad group of species that are alike in some ways,

but not enough to be classified as the same species. For example, the genus *Quercus* includes all the oaks. The second word in the scientific name is the **species** name. Thus, *Quercus rubra* is the scientific name for only northern red oak.

Another classification term used in this book is the **family**. A family is a group of genera that are closely related. The first part of the family name comes from the most common or typical genus in that family. Family names always end in “aceae,” pronounced “ay-cee-ee.” An example of a family name is Ulmaceae, which includes the genus elms (*Ulmus*), genus hackberries (*Celtis*), and other genera.



pecies Description

This section contains descriptions and illustrations for 60 common native and introduced tree species in Nebraska. For each species a brief description of the leaves, twigs, fruit, bark, wood, and general comments is presented. Very distinctive characteristics are indicated with bold lettering. Species names are alphabetized by genus under the broad divisions — **Gymnosperms** and **Angiosperms**.

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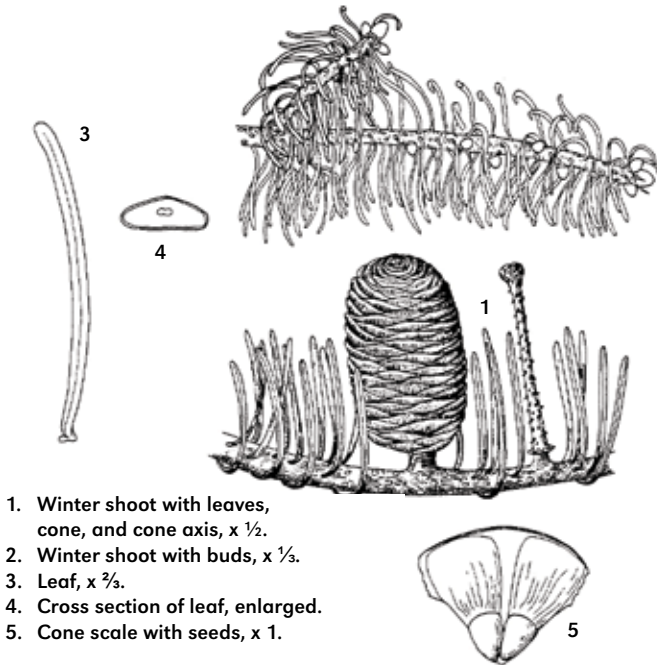
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GYMNOSPERMS

Gymnosperms are technically not flowering plants, even though they have pollen-bearing and seed-bearing structures that resemble flowers. Gymnosperm trees are often referred to as coniferous, softwood, or evergreen and include many of the world's most interesting and useful trees. They have an ancient ancestry, predating the angiosperms. The main distinguishing characteristic of gymnosperms is their uncovered seed, usually held on a scale in a cone-like fruit. The Latin term "**gymno spermae**" actually means "naked seed."

Abies concolor



1. Winter shoot with leaves, cone, and cone axis, x 1/2.
2. Winter shoot with buds, x 1/3.
3. Leaf, x 2/3.
4. Cross section of leaf, enlarged.
5. Cone scale with seeds, x 1.

Abies concolor (White Fir, Concolor Fir)

Leaves: Needles borne singly; 2" to 3" long; **flattened in cross-section**; silver-blue to silver-green.

Twigs: Moderately stout; glabrous; yellow-green to brown-green; round leaf scar. Buds 1/4" long or less; tend to be sticky; yellow-brown.

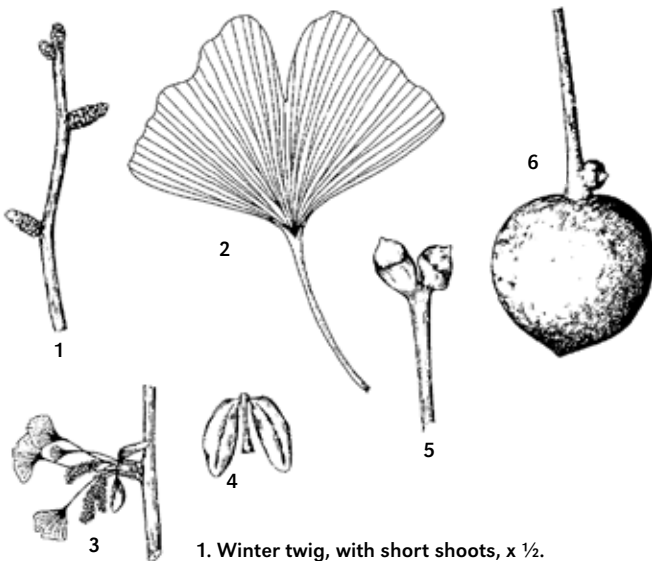
Fruit: Cone; 3" to 5" long; oblong; green to purple; **borne upright on upper branches; scales deciduous**; monoecious.

Bark: Thin; smooth; gray; with resinous blisters; becoming furrowed and ridged on older trunks.

Wood: Soft and brittle; white to yellow-brown; even grained; growth rings distinct. Moderate importance for wood products.

General: Native to southern Rocky Mountains and California. Used as an ornamental throughout much of the United States. Shade tolerant.

Ginkgo biloba



1. Winter twig, with short shoots, x 1/2.
2. Leaf, x 1/2.
3. Pollen-bearing twig, x 1/2.
4. Pollen sacs, enlarged.
5. Unfertilized seed twig, enlarged.
6. Mature fleshy seed, x 3/4.

Ginkgo biloba (Ginkgo, Maidenhair Tree)

Leaves: Broad; deciduous; **fan-shaped**; with or without notched margin; **branching venation, giving the appearance of long, flowing "maiden's hair"**; spiral arrangement on young twigs; on older branches only occur on short, spur shoots; bright yellow-green; turn bright yellow in fall, petiole 2" to 4" long.

Twigs: Stout; light brown first year, becoming gray with stringy, peeling bark; short spur shoots on older twigs. Buds with overlapping scales, brown.

Fruit: Plum-like in shape and size; about 1" to 1 1/2" long; tan to orange; fleshy covering very messy and bad smelling; monoecious.

Bark: Light gray-brown; tight ridges with darker furrows.

Wood: Unimportant for wood products.

General: A native of China and Japan. Grows well in Nebraska. Strong, upright growth form. Tolerates urban environments. Only male trees should be planted because of bad smelling, messy fruit. Shade intolerant.

Juniperus scopulorum (Rocky Mountain Juniper)

Leaves: Awl-shaped or scalelike; both kinds often on the same tree; pressed close to the twig; variable in color; **retains blue-green color in winter.**

Twigs: Slender; older twigs red-brown and nearly glabrous, younger twigs covered by foliage. Buds very small, indistinct, not useful for identification purposes.

Fruit: Berry-like; **takes two years to mature;** nearly round; ¼" to ½" in diameter; bright blue; often covered with a white coating; usually contains 2 seeds; dioecious.

Bark: Brown to gray; fibrous; peels in narrow strips.

Wood: Soft; lightweight; light red heartwood with narrow white sapwood. Moderate importance for wood products; used for fence posts, closet lining, crafts, and novelties.

General: Native to western Nebraska, the Rocky Mountains, and southwest Canada. Very drought resistant, often used in windbreaks in western Nebraska. Intermediate shade tolerance.

Juniperus virginiana (Eastern Redcedar)

Leaves: Awl-shaped or scale-like, both kinds often on the same tree; blue-green **turning a red-brown to purple color in winter.**

Twigs: Slender; green or red-brown in color; younger twigs covered by foliage. Buds very small; indistinct; not useful for identification purposes.

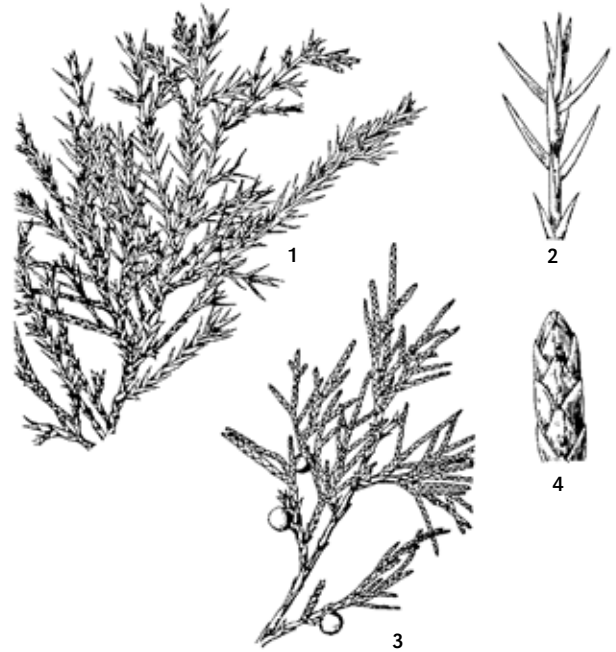
Fruit: Berry-like; round; about ¼" in diameter; blue or purple; often with white, waxy coating; contains 2 or 3 hard seeds; **ripens in one season;** dioecious.

Bark: Brown to gray; fibrous; peels in narrow strips.

Wood: Sapwood nearly white; heartwood purple or rose-red to red-brown; characteristic odor; growth rings distinct. Moderate importance for wood products; used for fence posts, closet lining, crafts, and novelties.

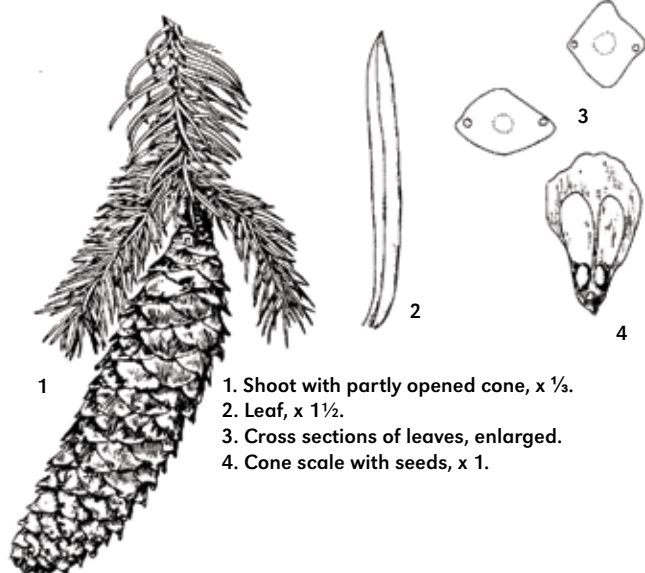
General: Native to eastern two-thirds of Nebraska and the rest of the eastern U.S. Often called "cedar," but not a true cedar. Hardy and long-lived. Medium to slow growth. Very good windbreak tree. Intermediate shade tolerance.

***Juniperus scopulorum* and
*Juniperus virginiana***



1. Shoot with needle-shaped leaves, x 2/3.
2. Tip of shoot, showing needle-shaped leaves, enlarged.
3. Cone-bearing shoot with scalelike leaves, x 2/3.
4. Tip of shoot, showing scalelike leaves, enlarged.

Picea abies



1. Shoot with partly opened cone, x 1/3.
2. Leaf, x 1 1/2.
3. Cross sections of leaves, enlarged.
4. Cone scale with seeds, x 1.

Picea abies (Norway Spruce)

Leaves: Needles borne singly; about 1" long; sharp; dark green; 4-angled.

Twigs: On older trees often hang down and sway in the wind; glabrous; leaves on a short stalk that remains part of the twig. Buds 1/4" long; red-brown or light brown; not resinous; scales often with spreading tips; rosette shaped.

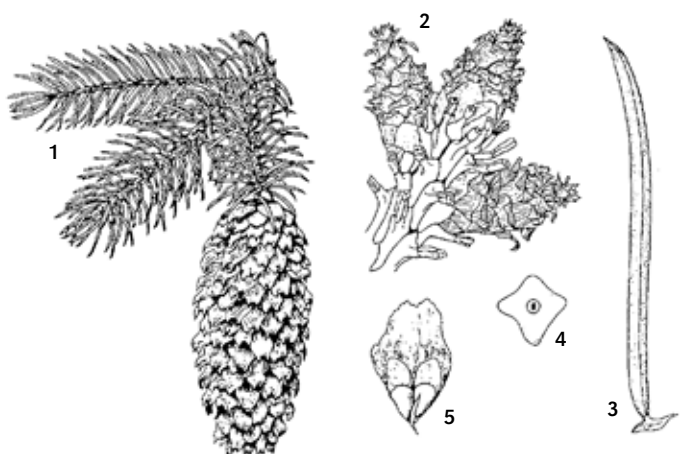
Fruit: Large papery cone, 4" to 7" long; light tan color; monoecious.

Bark: Light to dark gray; made up of thin scales; in wide ridges on older trees.

Wood: Light colored; indistinct heartwood; slightly resinous. Important for wood products in Europe and somewhat in eastern U.S.; used for pulp and paper.

General: Native to Europe. Widely planted as an ornamental in U.S. Gets taller, wider, and grows faster than blue spruce. Intermediate shade tolerance.

Picea pungens



1. Winter shoot, with leaves and cone, x 1/3.
2. Shoot with winter buds, leaves cut off, x 2.
3. Leaf, x 2 1/2.
4. Cross section of leaf, enlarged.
5. Cone scale with seeds, x 1.

Picea pungens (Blue Spruce, Colorado Blue Spruce)

Leaves: Needles borne singly; about 1" long; blue-white to dark green; 4-angled; sharp pointed; extend at right angles all around twig; very fragrant when crushed.

Twigs: Glabrous; leaves on a short stalk that remains part of the twig. **Buds with scales that tend to turn out into a rosette**, especially in spring.

Fruit: Papery cone, about 2 1/2" to 4" long; light chestnut-brown; monoecious.

Bark: Light to dark gray; made up of thin scales; in wide ridges on older trees.

Wood: Heartwood not distinct; nearly white to light brown; growth rings distinct. Moderate importance for wood products.

General: Native to Colorado and Intermountain states. Often planted in Nebraska as an ornamental. Foliage color varies from green to blue. Slow growing. Intermediate shade tolerance.

Pinus banksiana (Jack Pine)

Leaves: Needles in groups of 2; $\frac{3}{4}$ " to $1\frac{1}{2}$ " long; twisted; yellow-green; remain on tree 2-3 years.

Twigs: Thin; tough; flexible; older twigs rough and red-brown. Buds $\frac{1}{4}$ " long; very resinous; light red-brown.

Fruit: Woody cone; no stalk; $1\frac{1}{2}$ " to 2" long; gray; curved; non-pointed scales; **usually remain closed and on tree for many years**, monoecious.

Bark: Dark brown; shallow ridged.

Wood: Light and soft; heartwood light brown. Moderately important for wood products; used for fence posts, pulp.

General: Native to the Lake States and much of central and eastern Canada. Widely planted by Charles Bessey and others on the Halsey District of the Nebraska National Forest in the Sandhills. Tough, drought tolerant; re-establishes quickly after fires when heat causes cones to open and release seed. Very shade intolerant.

Pinus flexilis (Limber Pine)

Leaves: Needles in groups of 5; $1\frac{1}{2}$ " to 3" long; rigid; dark green; covered with lengthwise rows of fine, white lines; remain on tree 5-6 years.

Twigs: Stout; **very flexible**; glabrous; silver-white to gray. Buds $\frac{1}{8}$ " to $\frac{1}{2}$ " long; pointed.

Fruit: Woody cone, short stalk; 3" to 8" long; thick, non-pointed scales; large, winged seeds, monoecious.

Bark: Thin; smooth; white to gray.

Wood: Light and soft. Unimportant for wood products.

General: Native to southwest-Panhandle of Nebraska and to the Intermountain U.S. Often very long-lived and slow growing, occurring on dry, harsh sites. Very shade intolerant.

Pinus sylvestris (Scotch Pine, Scots Pine)

Leaves: Needles in groups of 2; $1\frac{1}{2}$ " to 3" long; blue-green, **often twisted**, may turn yellow-green in Nebraska during winter.

Twigs: Medium-thick; dull gray-yellow; roughened by scales at base of leaf clusters. Buds $\frac{1}{4}$ " to $\frac{1}{2}$ " long; pointed; with fringed scales; red-brown; resinous.

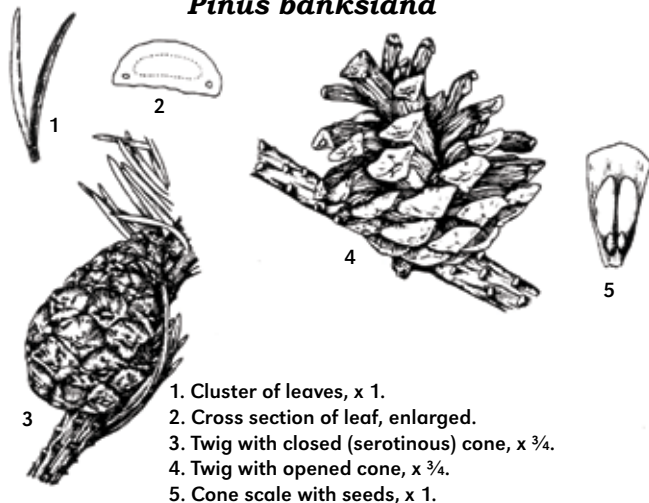
Fruit: Woody cone; $1\frac{1}{2}$ " to 2" long; scales with raised pyramid-shaped tips, monoecious.

Bark: **Distinctively orange colored on upper limbs and trunk of older trees.**

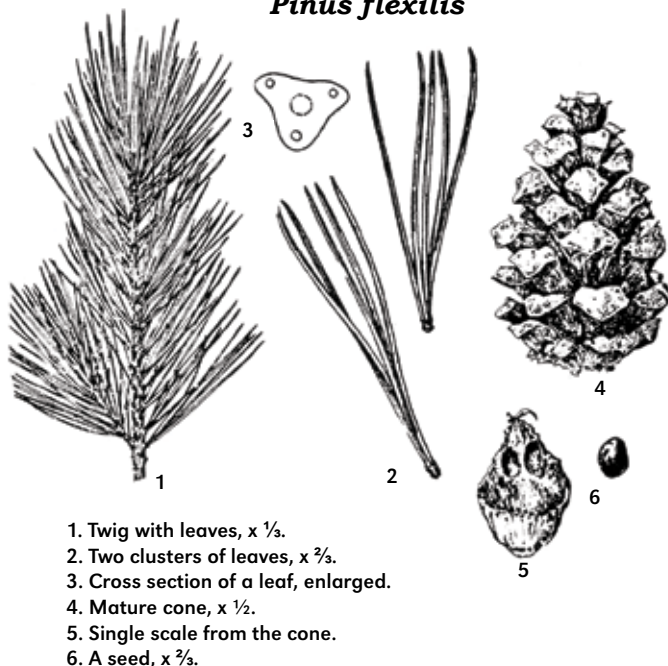
Wood: Seldom used in the U.S. wood products industry; little data available.

General: Native throughout Europe, but was widely planted in Nebraska. **Currently not recommended for planting because of the devastating Pine Wilt disease.** May still be planted for short-term purposes, like Christmas trees. Shade intolerant.

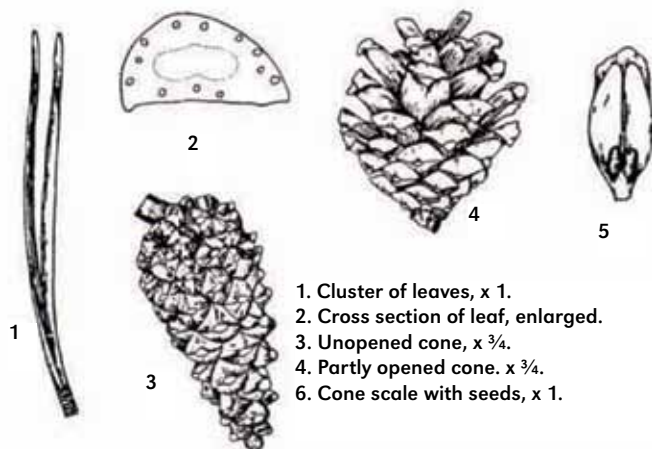
Pinus banksiana



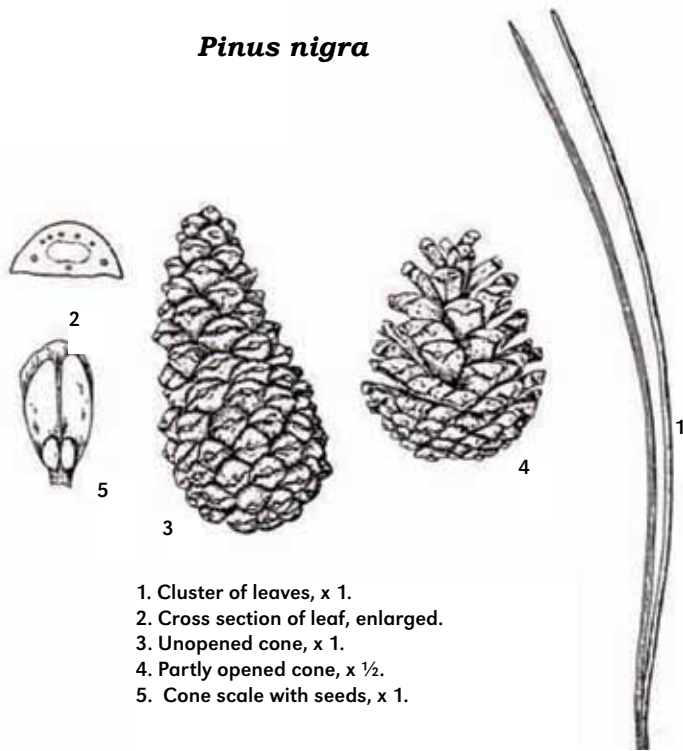
Pinus flexilis



Pinus sylvestris



Pinus nigra



1. Cluster of leaves, x 1.
2. Cross section of leaf, enlarged.
3. Unopened cone, x 1.
4. Partly opened cone, x 1/2.
5. Cone scale with seeds, x 1.

Pinus nigra (Austrian Pine)

Leaves: Needles in bundles of 2; 3" to 6" long; slender, stiff, sharp-pointed; yellow-green to blue-green; remain on tree 3-4 years.

Twigs: Orange-brown; glabrous. Buds silvery, 1/2" to 3/4" long.

Fruit: Woody cone; 2" to 3" long; **non-pointed scales;** monoecious.

Bark: Rough; platey; dark brown turning gray when older.

Wood: Sapwood nearly white; heartwood red-brown, somewhat oily and resinous; growth rings distinct. Seldom used for wood products in the U.S.

General: A native of Europe, but grows well in Nebraska. Similar in size and habit to native ponderosa pine. Shade intolerant.

Pinus ponderosa (Ponderosa Pine)

Leaves: Needles in bundles of 2 and 3; 5" to 11" long; yellow-green; less sharp-pointed than those of Austrian pine; somewhat twisted; remain on tree 3-6 years.

Twigs: Stout; orange-brown; smell like turpentine when crushed, Buds about 1/2" long, usually covered with resin droplets; light brown.

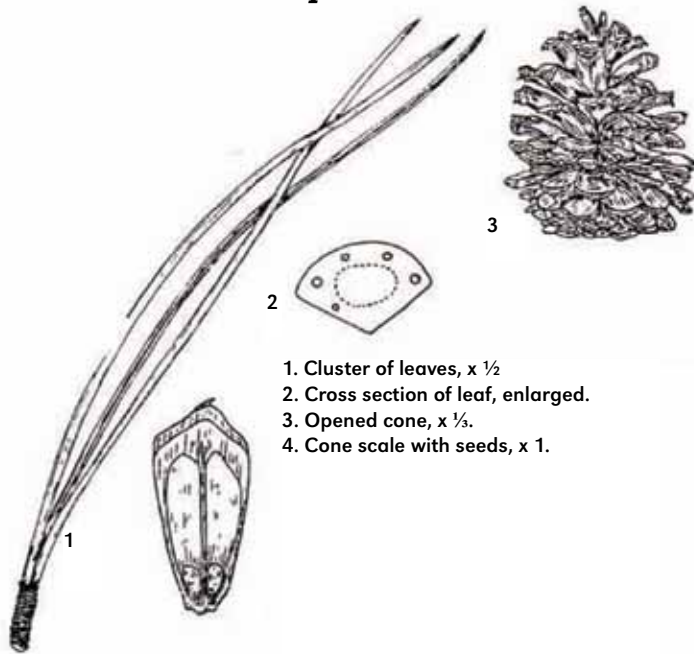
Fruit: Woody cone; 3" to 6" long; **each scale armed with a short, sharp spine;** monoecious.

Bark: Dark brown to black on younger trees; older trees have large plates, **orange to cinnamon-red,** separated by deep furrows.

Wood: Sapwood white to yellow; heartwood yellow to light brown; growth rings distinct. Very important for wood products; used for lumber, millwork, and railroad ties.

General: Native to northwestern Nebraska and much of the western U.S. Normal growth rate in Nebraska is relatively slow. **Fire resistant because of its thick bark.** Drought resistant. Shade intolerant.

Pinus ponderosa



1. Cluster of leaves, x 1/2
2. Cross section of leaf, enlarged.
3. Opened cone, x 1/3.
4. Cone scale with seeds, x 1.

Pinus strobus (Eastern White Pine)

Leaves: Needles in bundles of 5; 3" to 5" long; dark blue-green, turning light green in winter in Nebraska; straight; slender; flexible; remain on tree 2-3 years.

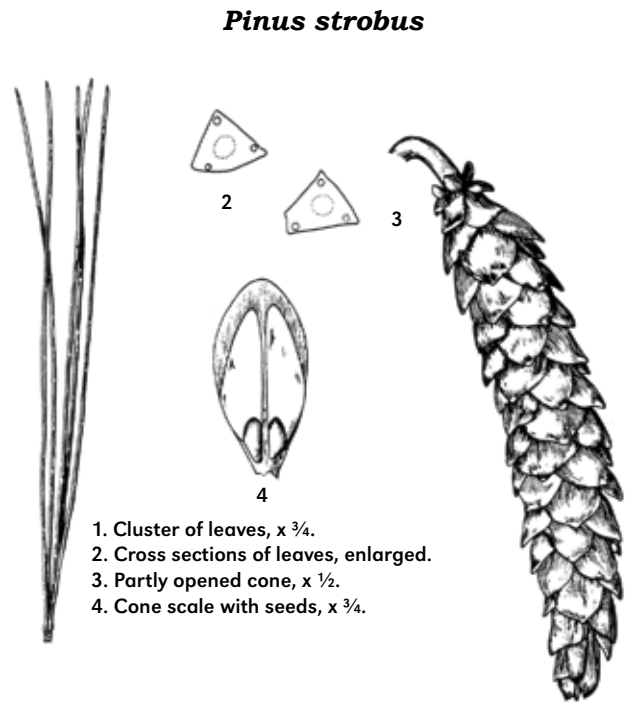
Twigs: Orange-brown; glabrous or with only a few, fine hairs. Buds covered with thin, red or orange-brown, non-pointed scales.

Fruit: Woody cone; 4" to 8" long, narrow; stalked; thin, non-pointed scales; monoecious.

Bark: Thin, smooth, and gray on young stems; breaks into rectangular plates on older stems.

Wood: Sapwood nearly white; heartwood darker; growth rings distinct. Important for wood products; used for lumber, fine millwork, and historically for sailing-ship masts.

General: Native to eastern U.S., but often planted in eastern Nebraska. Fast growth on good sites. Shade tolerant when young; intolerant when older.



1. Cluster of leaves, x $\frac{3}{4}$.
2. Cross sections of leaves, enlarged.
3. Partly opened cone, x $\frac{1}{2}$.
4. Cone scale with seeds, x $\frac{3}{4}$.

Pseudotsuga menziesii (Douglas-fir)

Leaves: Needles borne singly; about 1" long; flat; blunt; yellow-green; remain on tree 5-8 years.

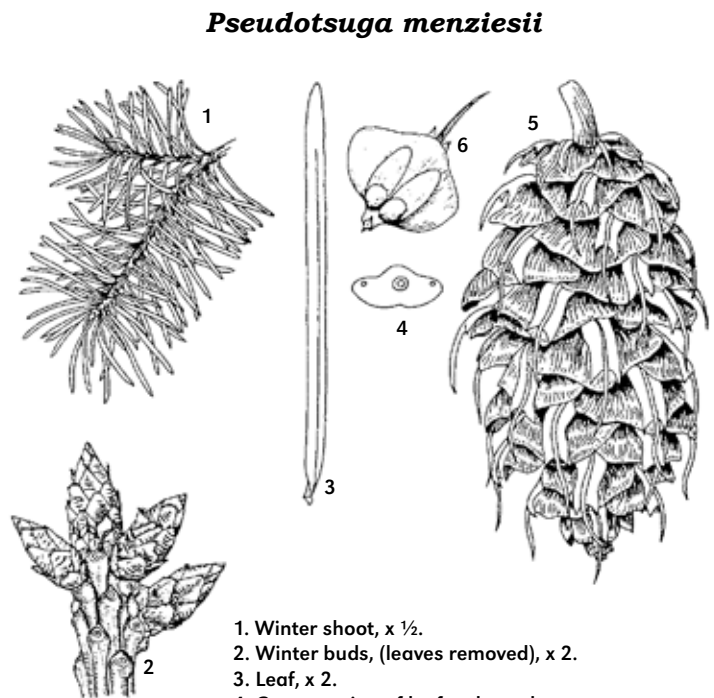
Twigs: Slender; flexible; covered with fine hairs; glabrous when leaves are detached. Buds cigar-shaped; sharp-pointed; about $\frac{1}{2}$ " long; brown.

Fruit: Thin-scaled cone; about 3" long; hangs down; **each scale has a 3-pointed woody bract attached to it**; monoecious.

Bark: Smooth; gray-brown; with resin blisters on young trees; rough and thick on older trees.

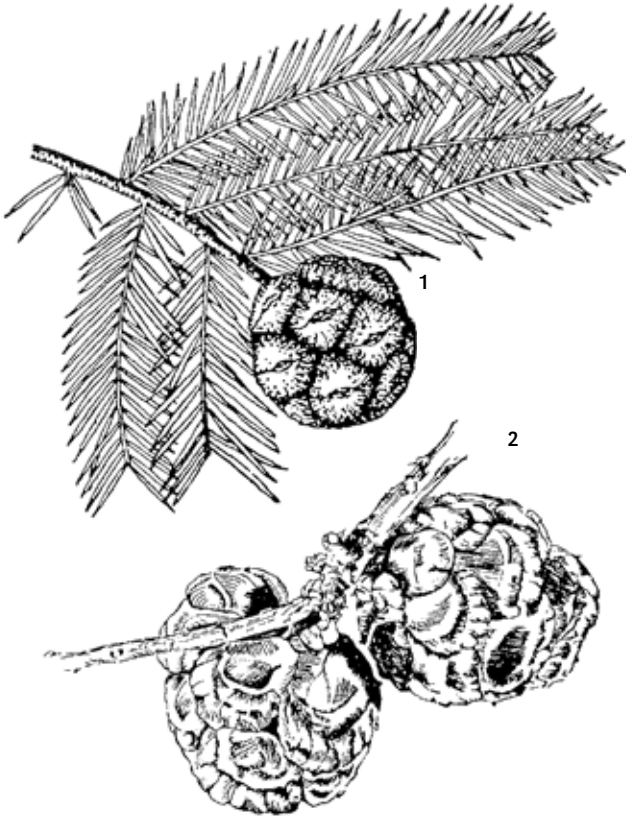
Wood: Sapwood white to yellow; heartwood yellow to red; growth rings very distinct. Very important for wood products; used for high-quality lumber and plywood.

General: Native to the Rocky Mountain states and Pacific coastal states. Not a true fir. Very valuable western timber tree. Narrower crown than many conifers. Good growth rate in Nebraska. Intermediate shade tolerance.



1. Winter shoot, x $\frac{1}{2}$.
2. Winter buds, (leaves removed), x 2.
3. Leaf, x 2.
4. Cross section of leaf, enlarged.
5. Opened cone, x 1.
6. Cone scale with seeds, x 1.

Taxodium distichum



1. Terminal twig with deciduous leaves and cone, x 1.
2. Open cones on twig, x 1½.

Taxodium distichum (Baldcypress)

Leaves: Needle-like; yellow-green; ½" to ¾" long; borne singly in 2 rows on slender green twigs; deciduous; shedding with twig in fall.

Twigs: Terminal twigs have buds and are not deciduous; lateral or side twigs deciduous with needles still attached. Buds small; round; several overlapping scale.

Fruit: Woody cone; round; hangs down; ¾" to 1" diameter; brown; several wrinkled scales; falls apart when mature; seeds small, 3-winged.

Bark: Thin and scaly to fibrous; red-brown to gray.

Wood: Light to dark brown; very durable and rot resistant. Important for wood products; used for construction, siding, shingles, etc.

General: Native throughout the southeast U.S. and as far north as southeast Missouri and southern Illinois. Typically grows in swamps in the southern U.S. Can live 1,000 to 2,000 years in its natural range. Does well in the eastern half of Nebraska as an ornamental. Shade intolerant.

ANGIOSPERMS

Angiosperms are true flowering plants and are the most common, complex, and widely distributed plants on earth. They are found from the tropics to the tundra and from deserts to mountain tops. Some angiosperms are small, primitive discs that float on water. Others are large trees. Unlike gymnosperms, the seeds of angiosperms are enclosed in protective tissue called an ovary. Angiosperm trees are often referred to as deciduous, broadleaf, or hardwood trees. Most broadleaf trees are angiosperms. All angiosperm trees native to Nebraska have deciduous leaves.

Acer negundo (Boxelder)

Leaves: Opposite; **once pinnately compound with 3 to 7 leaflets**; leaflets quite variable, ovate to lanceolate, coarsely serrate margins or sometimes 3-lobed at base; rachis stout, enlarged at the base.

Twigs: Stout; **green to purple-green**; frequently covered with a blue-white coating. Terminal bud oval, somewhat white and woolly.

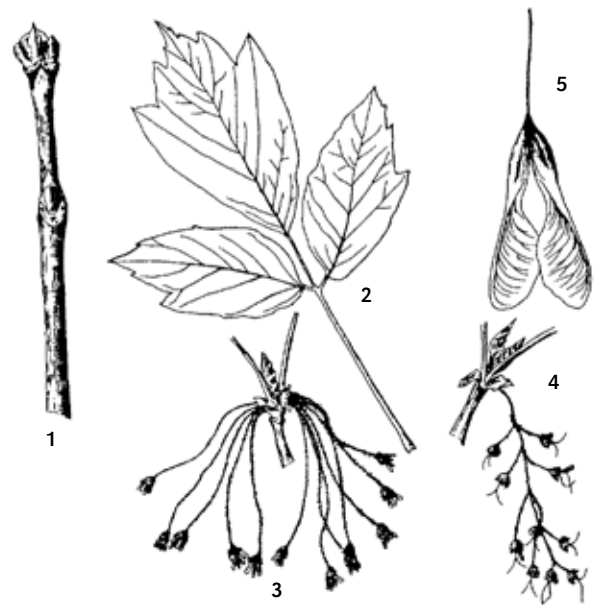
Fruit: Samara; V-shaped; double-winged; hangs down; ripens in fall; dioecious.

Bark: Thin; pale gray or light brown; deeply divided by furrows into rounded, interlacing ridges.

Wood: Light and soft; sapwood white; heartwood light brown; often reddish streaked; growth rings not very distinct; diffuse-porous. Unimportant for wood products; used occasionally for cheap furniture, wooden ware, etc.

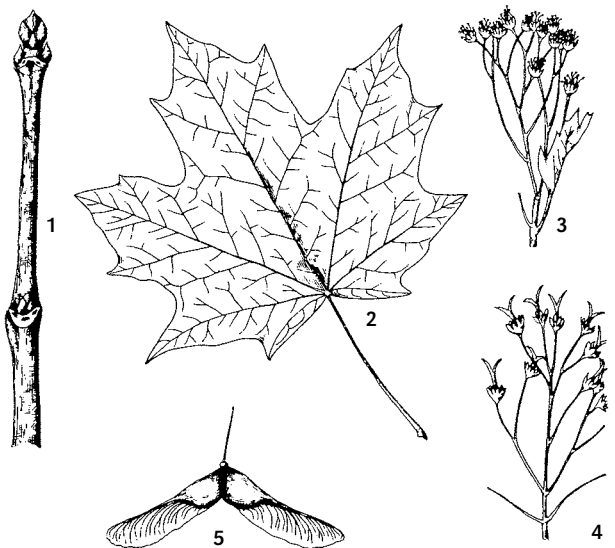
General: Native to all of Nebraska, most of the U.S., and parts of Canada and Mexico. Very common, but undesirable as an ornamental. Very hardy. Because of its common name and compound leaves, most people do not realize that **boxelder is a maple**. Intermediate shade tolerance.

Acer negundo



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{3}$.
3. Male flowering shoot, x $\frac{1}{2}$.
4. Female flowering shoot, x $\frac{1}{2}$.
5. Fruit, samara, x $\frac{3}{4}$.

Acer platanoides



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{5}$.
3. Raceme of staminate flowers, x $\frac{1}{2}$.
4. Raceme of female flowers, x $\frac{1}{2}$.
5. Fruit, samara, x $\frac{1}{2}$.

Acer platanoides (Norway Maple)

Leaves: Opposite; simple; 4" to 7" wide and long; typically palmately 5-lobed, lobes sharply pointed; somewhat serrate margin; **bright green to dark purple**, depending on variety; turning yellow in fall; petiole 2" to 4" long; **milky sap** exudes when petiole broken or removed from stem (this may not occur later in the summer).

Twigs. Stout; olive-brown; glabrous; leaf scars meet. Terminal bud $\frac{1}{4}$ " to $\frac{3}{8}$ " long, rounded, green-red to red, glabrous; lateral buds smaller.

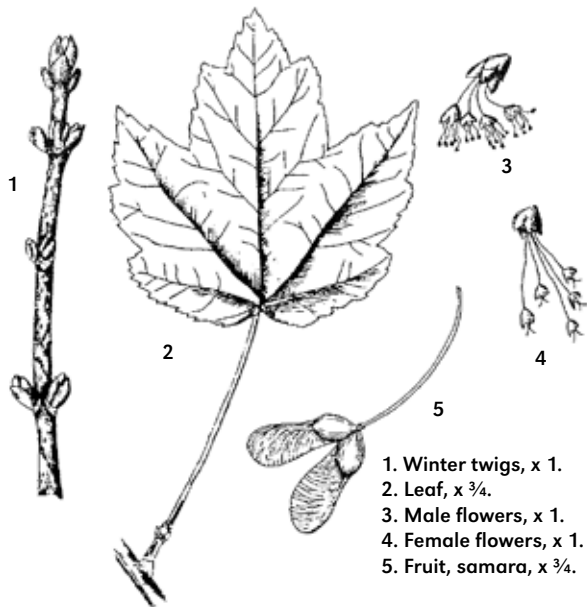
Fruit: Samara; 2 wide-spread wings, $1\frac{1}{2}$ " to 2" long; matures in September or October; polygamous.

Bark: Smooth and gray-brown on young stems; furrowed on older stems.

Wood: Seldom used in U.S.; presumably similar to sugar maple.

General: Native to northern Europe. Often planted in Nebraska as an ornamental tree. Many varieties available with summer leaf color varying from dark green to dark purple. Varieties with purple foliage sometimes wrongly called red maple. Shade tolerant.

Acer rubrum



1. Winter twigs, x 1.
2. Leaf, x $\frac{3}{4}$.
3. Male flowers, x 1.
4. Female flowers, x 1.
5. Fruit, samara, x $\frac{3}{4}$.

Acer rubrum (Red Maple)

Leaves: Opposite; simple; 2" to 6" wide and long; **typically palmately 3-lobed** (rarely 5-lobed); coarsely serrate margin; turning scarlet in fall; petiole 2" to 4" long.

Twigs: Slender; dark red; without a disagreeable odor when crushed. Terminal bud $\frac{1}{16}$ " to $\frac{1}{8}$ " long, red to green, not pointed.

Fruit: Samara; **2 slightly spread wings, $\frac{1}{2}$ " to 2" long**; matures in late spring; polygamous.

Bark: Smooth and light gray on young stems; eventually breaking into long, scaly plates separated by shallow furrows.

Wood: Sapwood white; heartwood light brown; growth rings not very distinct; diffuse-porous. Moderately important for wood products; uses similar to silver maple.

General: Native to most of the eastern U.S. Resembles silver maple in many ways, but the smaller, 3-lobed leaf and smaller fruit are distinctive. Often planted as an ornamental in Nebraska. Shade tolerant.

Acer saccharinum (Silver Maple)

Leaves: Opposite, simple; 4" to 7" wide and long; deeply, palmately 5-lobed; margins of end lobe V-shaped; coarsely serrate margins; green and glabrous on upper surface; **silver-white below**; turn pale yellow in fall; petiole 3" to 5" long.

Twigs: Slender; orange-brown to red; disagreeable odor when bruised. Terminal bud blunt, $\frac{1}{8}$ " to $\frac{1}{4}$ " long.

Fruit: Samara; **2 widely spread wings, about 1½" long**; matures in late spring and germinates immediately; polygamous.

Bark: Smooth and silver-gray on young stems; later breaking into long, thin, scaly plates that curl away from the tree at the ends.

Wood: Hard, heavy, strong; sapwood white; heartwood light brown; growth rings not very distinct; diffuse-porous. Moderately important for wood products; used in boxes, pallets, crates, and novelties. Sometimes used as a substitute for sugar maple in flooring and furniture.

General: Native to eastern Nebraska and most of the eastern U.S. A large and beautiful tree. Grows rapidly, but tends to be brittle and breaks easily in storms. Shade tolerant.

Acer saccharum (Sugar Maple)

Leaves: Opposite; simple; 3" to 5" wide and long; palmately **5-lobed**; **lobe margins entire or sometimes wavy serrate**; turn bright red, orange, or yellow in the fall; petiole about 2" long.

Twigs: Slender; glabrous; red-brown; shiny. Terminal bud $\frac{1}{4}$ " to $\frac{3}{8}$ " long, pointed, 4-8 pairs of scales.

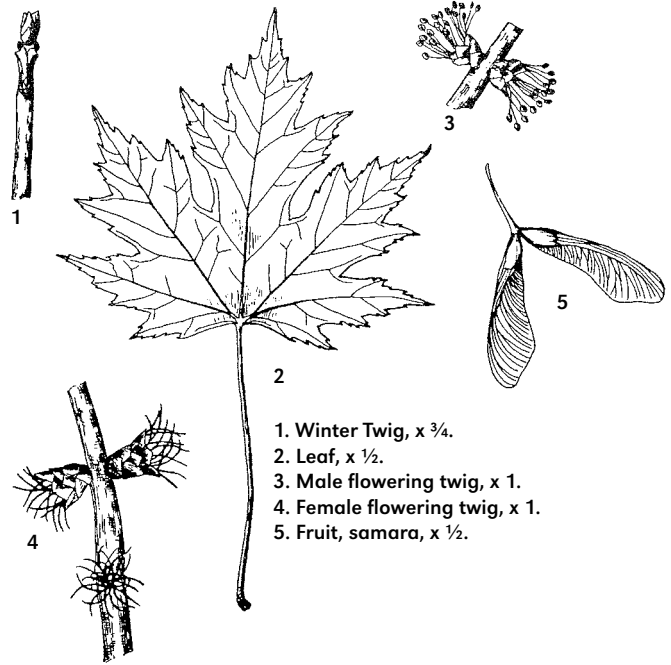
Fruit: Samara; **U-shaped, double-winged**; matures in fall; polygamous.

Bark: Gray, deeply furrowed on older trees; with long, irregular plates or ridges; sometimes scaly.

Wood: Hard, heavy, strong; sapwood white with a red tinge; heartwood light brown; growth rings fairly distinct; diffuse-porous. Important for wood products; used for interior trim, flooring, furniture, musical instruments, etc.

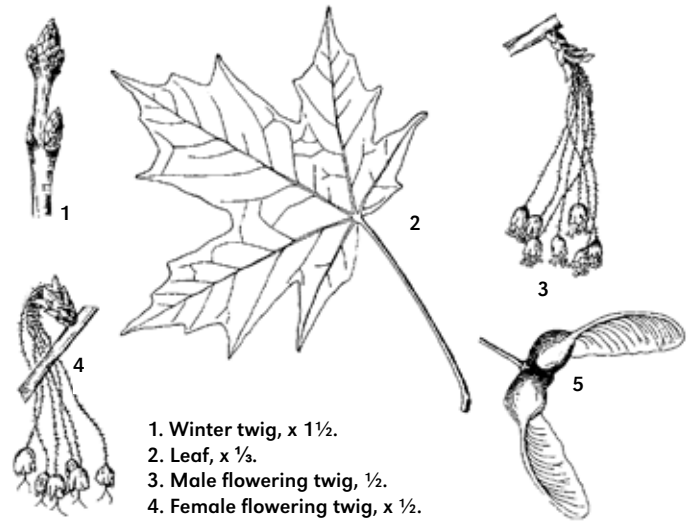
General: Native to most of the northeastern U.S. (east from Iowa and north from Tennessee). Commercially the most important of the maples. Noted for maple syrup made from its sap. Planted as an ornamental in eastern Nebraska. Shade tolerant.

Acer saccharinum



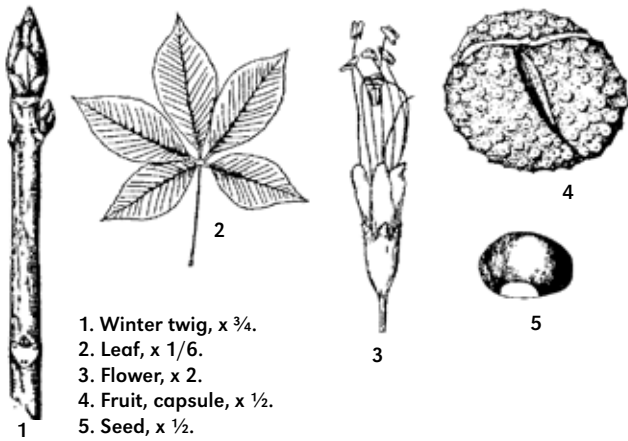
1. Winter Twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{2}$.
3. Male flowering twig, x 1.
4. Female flowering twig, x 1.
5. Fruit, samara, x $\frac{1}{2}$.

Acer saccharum



1. Winter twig, x $1\frac{1}{2}$.
2. Leaf, x $\frac{1}{5}$.
3. Male flowering twig, $\frac{1}{2}$.
4. Female flowering twig, x $\frac{1}{2}$.
5. Fruit, samara, x $\frac{3}{4}$.

Aesculus glabra



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{6}$.
3. Flower, x 2.
4. Fruit, capsule, x $\frac{1}{2}$.
5. Seed, x $\frac{1}{2}$.

Aesculus glabra (Ohio Buckeye)

Leaves: Opposite; palmately compound; **5 leaflets**, ovate or oval, 3" to 6" long, finely serrate margins, glabrous; bad smelling when crushed.

Twigs: Stout; glabrous; orange to brown to ash-gray. Terminal buds large, brown, not resinous.

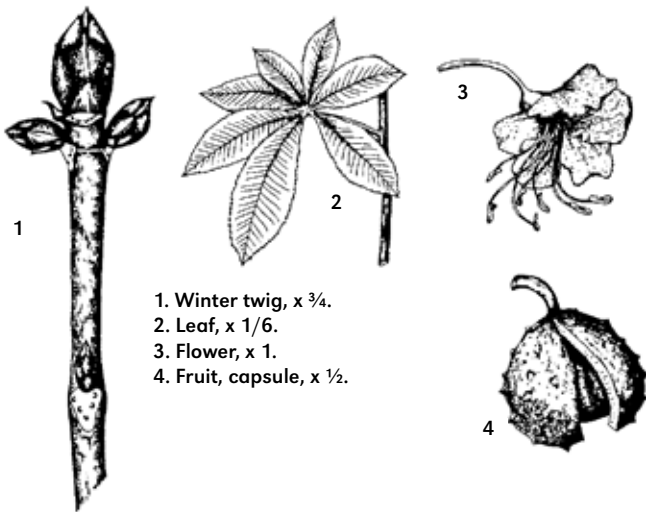
Fruit: Globular capsule; thick, leathery, prickly, brown, 1" to 2" diameter, containing **a large, smooth, shiny, brown seed**, about 1" long; kernel is poisonous; perfect flowers.

Bark: Ash-gray; thick; deeply furrowed and scaly.

Wood: Sapwood white to dull white; heartwood creamy to yellow; growth rings normally not visible; diffuse-porous. Unimportant for wood products.

General: Native to extreme southeastern Nebraska and the east-central U.S. Not common anywhere. Prefers moist, protected sites. Shade tolerant.

Aesculus hippocastanum



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{6}$.
3. Flower, x 1.
4. Fruit, capsule, x $\frac{1}{2}$.

Aesculus hippocastanum (Horsechestnut)

Leaves: Opposite; palmately compound; **usually 7 leaflets**, obovate, 5" to 7" long, margins doubly serrate.

Twigs: Stout; glabrous; red-brown. Terminal buds over 1" long, brown, covered with waxy gum, shiny.

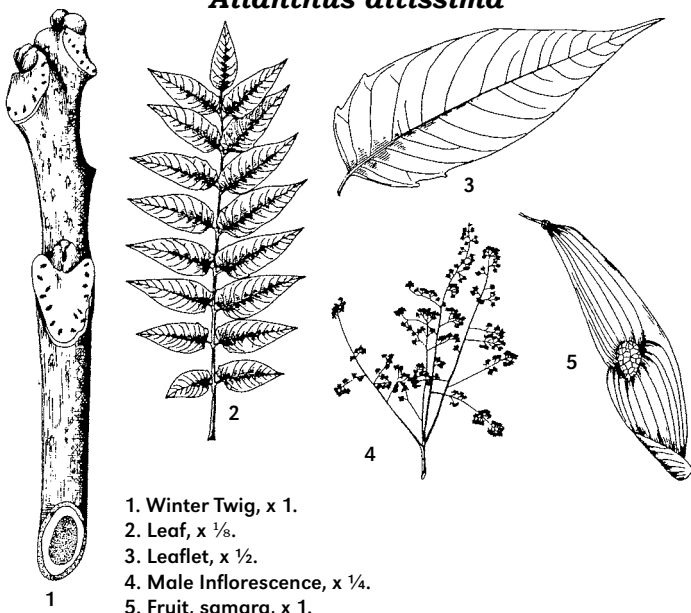
Fruit: Globular pod; thick, leathery, prickly, yellow-brown, 1" to 2" diameter, containing **1 to 3 smooth, shiny, brown seeds**; perfect flowers.

Bark: Similar to Ohio buckeye.

Wood: Similar to Ohio buckeye.

General: Native to Asia. Sometimes planted as an ornamental in Nebraska. Prefers moist, protected sites. Shade tolerant.

Ailanthus altissima



1. Winter Twig, x 1.
2. Leaf, x $\frac{1}{8}$.
3. Leaflet, x $\frac{1}{2}$.
4. Male Inflorescence, x $\frac{1}{4}$.
5. Fruit, samara, x 1.

Ailanthus altissima (Tree-of-Heaven, Ailanthus)

Leaves: Alternate; once pinnately compound; **1' to 4' long with 11 to 41 leaflets**; leaflets ovate-lanceolate, 3" to 6" long, entire margins except for 1-2 teeth near base; bad smelling when crushed.

Twigs: Very coarse; velvety or downy; brown pith. No terminal bud; Lateral buds round, brown, normally hairy, relatively small.

Fruit: Samara; oblong; spirally twisted wing in center of which is a single, dry seed; normally occurs in great abundance; dioecious.

Bark: **Thin; gray; smooth**; becomes slightly furrowed with age.

Wood: Light colored; brittle. Unimportant for wood products.

General: Native to China, but becoming naturalized over much of the eastern U.S. Starts readily from seed that is scattered by wind, and from root sprouts. Thrives under almost any type of condition, particularly harsh, urban conditions. Resistant to smoke and gases. Considered an undesirable tree by most people. Shade intolerant.

Amelanchier arborea (Downy Serviceberry)

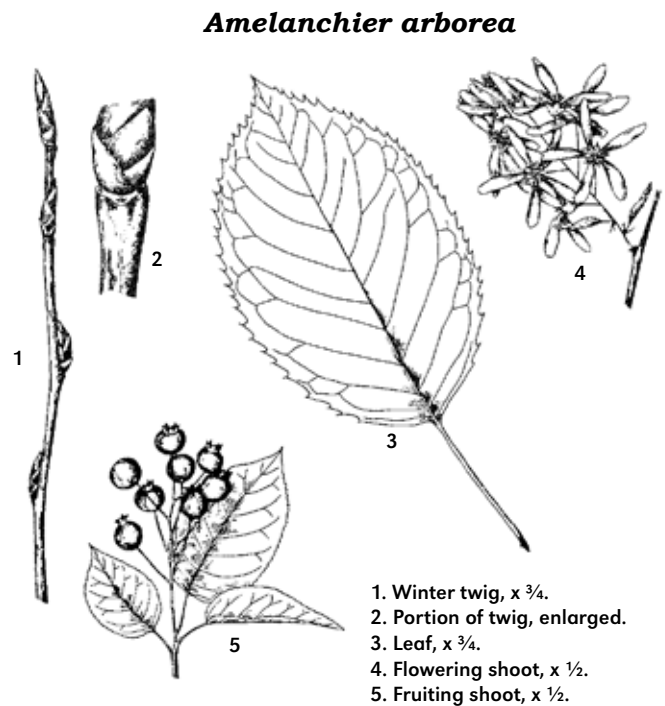
Leaves: Alternate; simple; oblong-ovate to oval; 2" to 4" long; finely serrate margin; pointed tip; dark green and glabrous above, pale below; petioles thin.
Twigs: Slender; red-brown to dark gray; bitter almond taste. Terminal bud ¼" to ½" long, conical, pointed, chestnut-brown.

Fruit: **Berry-like pome;** round; ¼" to ½" diameter; dark red to purple; more or less with a gray to white waxy coating; sweet; perfect flowers.

Bark: Thin, gray, often streaked with darker lines; smooth or slightly furrowed with scaly ridges.

Wood: Heavy; hard; close-grained; sapwood light colored, wide; heartwood light brown; diffuse-porous. Unimportant for wood products.

General: Native to extreme southeastern Nebraska and most of the eastern U.S. Found on east-facing bluffs along the Missouri River as a small tree mixed with other hardwoods. **Beautiful white, showy flowers appear in early spring** before other trees leaf out. Shade tolerant.



Asimina triloba (Pawpaw)

Leaves: Alternate; simple, obovate-oblong; 10" to 12" long, 4" to 6" wide; entire margin; pointed tip; base wedge-shaped; strong smelling when crushed.

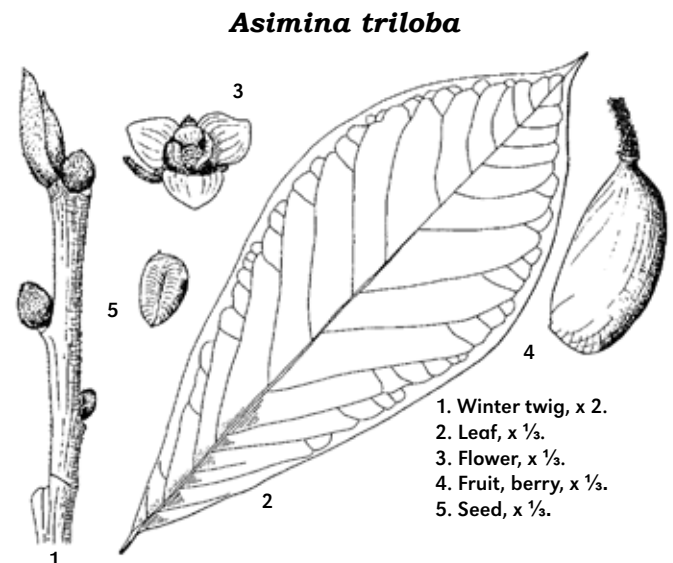
Twigs: Slender; brown; hairy; divided pith. Terminal bud flat, about ½" long, with rust-colored hairs.

Fruit: **Banana-like berry; 3" to 5" long;** oblong; yellow at first, finally turning brown; flesh sweet and edible, especially while still yellow; perfect flowers.

Bark: Thin; brown to gray with blotches; smooth or warty.

Wood: Unimportant for wood products.

General: Native to southeast Nebraska and most of the eastern U.S. Small understory tree found in rich, moist, bottomland soils. **Unusual purple-colored flowers.** Intermediate shade tolerance.



Betula nigra (River Birch)

Leaves: Alternate; simple; rhombic-ovate; doubly serrate margin; wedge-shaped base; tapering sides; petiole short, hairy.

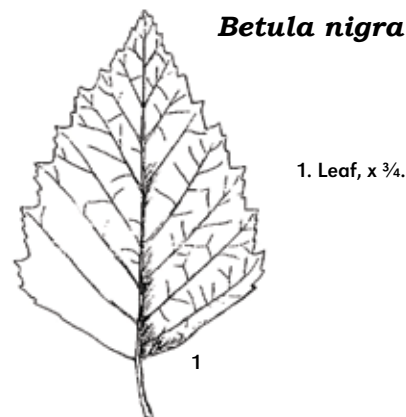
Twigs: Slender; red-brown; more or less hairy below. No terminal bud; lateral buds pointed.

Fruit: Cone-like; cylindrical; upright; contains many hairy scales and 2-winged nutlets; monoecious.

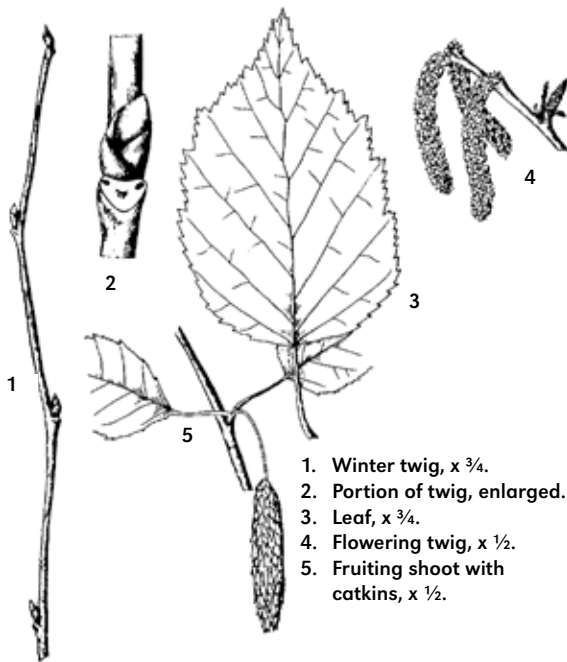
Bark: Thin; **salmon-pink to red-brown; papery.**

Wood: Sapwood white to yellow; heartwood brown; growth rings not distinct; diffuse-porous. Unimportant for wood products.

General: Native to eastern and southeastern U.S. Normally found along streams on cool, moist sites. Often planted as an ornamental tree in Nebraska. Shade intolerant.



Betula papyrifera



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Flowering twig, x $\frac{1}{2}$.
5. Fruiting shoot with catkins, x $\frac{1}{2}$.

Betula papyrifera (Paper Birch)

Leaves: Alternate; simple; 2" to 3" long; ovate to oval; doubly serrate margin; pointed tip; rounded base; glabrous; dark green above; light yellow-green below; petiole slender, $\frac{3}{4}$ " to 1" long.

Twigs: Slender; dark orange-brown; glabrous to somewhat hairy; spur shoots on older growth. No terminal bud; lateral buds pointed, gummy, chestnut-brown.

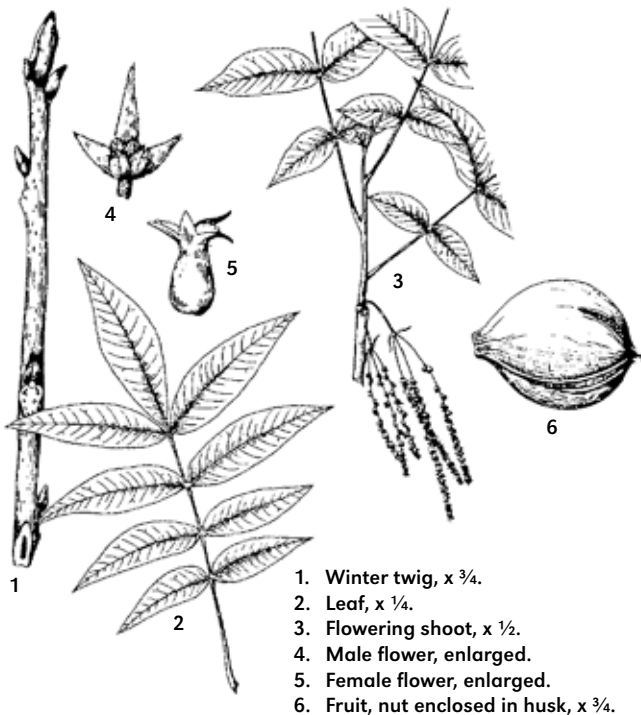
Fruit: Cone-like; cylindrical; hangs down; 1" to 1½" long; contains many hairy scales and 2-winged nutlets; monoecious.

Bark: At first brown; **later becoming chalky-white, splitting horizontally into thin papery strips**, very characteristic; inner bark orange.

Wood: Light colored; diffuse-porous; strong. Moderately important for wood products; used for pulp, lumber, firewood.

General: Native to northern Nebraska along Niobrara River, much of northern U.S., and Canada. Widely planted for ornamental purposes, but does poorly in eastern Nebraska because of borers. Occurs naturally in moist areas, normally mixed with conifers. Shade intolerant. **Note:** European white birch (*Betula pendula*), is also planted as an ornamental in Nebraska and often confused with paper birch because of its white bark. However, its bark does not peel like paper birch and its twigs are smoother (not hairy) and are often pendulous or "weeping" in appearance.

Carya condiformis



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{4}$.
3. Flowering shoot, x $\frac{1}{2}$.
4. Male flower, enlarged.
5. Female flower, enlarged.
6. Fruit, nut enclosed in husk, x $\frac{3}{4}$.

Carya condiformis (Bitternut Hickory)

Leaves: Alternate; once pinnately compound; 6" to 10" long; **7-11 leaflets**; the terminal leaflet larger than the side leaflets, leaflets lanceolate or ovate-lanceolate to oblong-lanceolate, serrate margins; rachis slender, slightly grooved, hairy.

Twigs: Stout; green to gray-brown. Terminal bud present, $\frac{1}{3}$ " to $\frac{3}{4}$ " long, **sulfur-yellow**, pointed, fine-hairy.

Fruit: Nut; thin-shelled; about 1" in diameter enclosed in a thin ($\frac{1}{8}$ " or less) 4 section husk; husk splits readily to release **nearly round**, bitter, thin-shelled nut; monoecious.

Bark: Firm; gray, smooth for many years; eventually having shallow, interlacing furrows.

Wood: Strong, hard, heavy; sapwood white or nearly white; darker heartwood; growth rings distinct; ring-porous. Important for wood products; used for tool handles, charcoal, fuel, etc.

General: Native to eastern Nebraska and most of the eastern U.S. Slow growing. Occurs in mixed hardwood stands. Most common of the hickories in Nebraska. Intermediate shade tolerance.

Carya ovata (Shagbark Hickory)

Leaves: Alternate; once pinnately compound; 8" to 14" long; **usually 5 leaflets**; terminal leaflet 5" to 8" long, side leaflets smaller, leaflets obovate to ovate-lanceolate, finely serrate margin; glabrous surfaced; rachis stout, grooved, glabrous.

Twigs: Stout; gray to red-brown; more or less hairy. Terminal bud **large, with 4 overlapping, brown scales**.

Fruit: Nut; 1" to 2.5" long; with a ¼" to ½" thick, 4-section husk; husk splits readily to release round nut, nut 4-ribbed with thick shell; edible sweet kernel; monoecious.

Bark: Smooth and gray on young stems; breaking into **thin, vertical plates that curve away from trunk; shaggy appearance is very characteristic**.

Wood: Hard, heavy; sapwood white to light brown; heartwood pale brown to brown; growth rings distinct; ring-porous or semi-ring-porous; important for wood products; used for tool handles, charcoal, fuel, etc.

General: Native to southeastern Nebraska and most of the eastern U.S. Typically found with oaks on upland sites. Slow growing. Intermediate shade tolerance.

Catalpa speciosa (Northern Catalpa)

Leaves: Opposite or whorled in 3's; simple; **heart-shaped; 4" to 10" long, 3" to 8" wide;** entire margin.

Twigs: Stout; green to purple; circular leaf scars. No terminal bud; buds smaller than leaf scars.

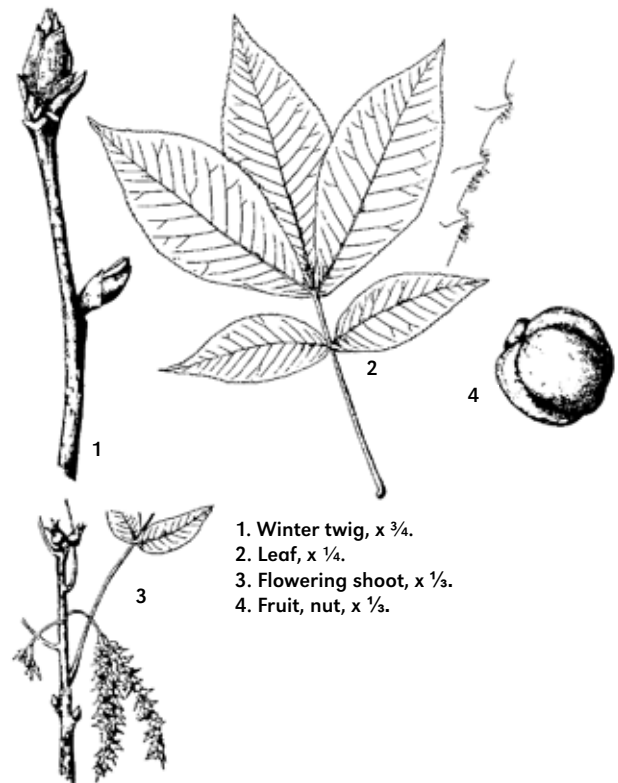
Fruit: Capsule; long; slender; 8" to 20" long; ½" in diameter; hangs on through the winter; perfect flowers.

Bark: Brown; broken into thick scales.

Wood: Soft, durable; sapwood pale gray; heartwood gray-brown; growth rings distinct; ring-porous. Not important for wood products; sometimes used for fence posts and railroad ties.

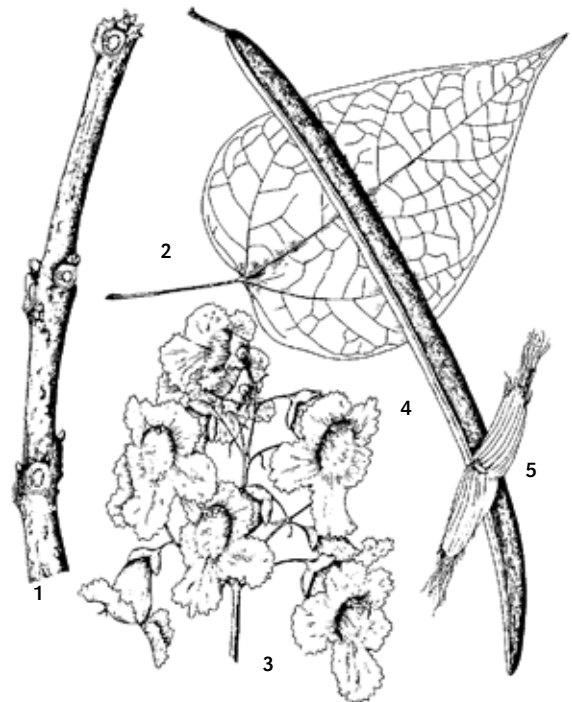
General: Native to a small area in southeastern Missouri, southern Illinois and Indiana, western Tennessee and Kentucky, and northeastern Arkansas. Has escaped cultivation and is naturalized in Nebraska. Has beautiful white fragrant flowers. Shade intolerant.

Carya ovata



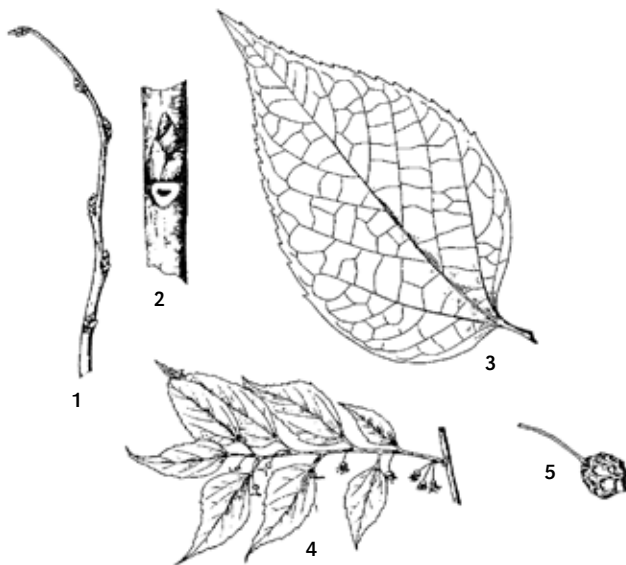
1. Winter twig, x ¾.
2. Leaf, x ¼.
3. Flowering shoot, x ⅓.
4. Fruit, nut, x ⅓.

Catalpa speciosa



1. Winter twig, x ¾.
2. Leaf, x ¼.
3. Panicle of flowers, x 3/8.
4. Fruit, capsule, x ½.
5. Seed, x 1.

Celtis occidentalis



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Flowering shoot, x $\frac{1}{3}$.
5. Fruit, drupe, x 1.

Celtis occidentalis (Hackberry)

Leaves: Alternate; simple; ovate to ovate-lanceolate; 2" to 4" long; serrate margin; frequently with a long tapering tip; base uneven; glabrous or slightly rough above; glabrous below; light, dull green; "nipple galls" often occur on underside of leaves; petiole about $\frac{1}{2}$ " long.

Twigs: Slender; zigzag; red-brown. No terminal bud; lateral buds small, pointed, pressed against the twig.

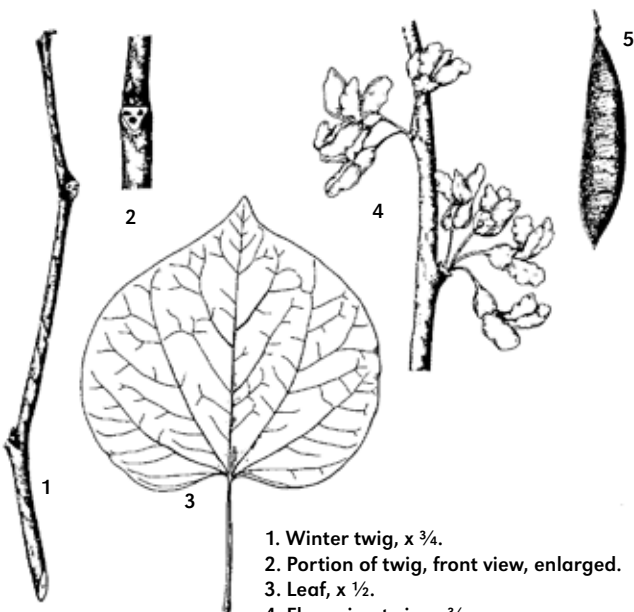
Fruit: Drupe; $\frac{1}{4}$ " in diameter; round; **purple**; one per stem, on stalks $\frac{1}{2}$ " to $\frac{3}{4}$ " long; flesh edible; ripen in September or October; polygamo-monoecious.

Bark: Gray-brown; smooth when young; develops characteristic **corky warts or ridges when older**; eventually becomes scaly.

Wood: Sapwood pale yellow to green-yellow; heartwood yellow to light brown; growth rings distinct; ring-porous; rays visible to the naked eye. Moderately important for wood products; often sold as elm.

General. Native to most of Nebraska and the eastern U.S., excluding the extreme southeast. Very common in Nebraska. A tough, durable, drought-resistant tree often used in windbreaks. Intermediate shade tolerance.

Cercis canadensis



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, front view, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering twig, x $\frac{3}{4}$.
5. Fruit, legume, x $\frac{1}{3}$.

Cercis canadensis (Eastern Redbud, Judas-tree)

Leaves: Alternate; simple; **heart-shaped**; 3" to 5" wide; entire margin; petiole long, slender.

Twigs: Usually zigzag; glossy brown. No terminal bud; lateral buds small, blunt, scaly, chestnut-brown.

Fruit: Legume; short-stalked; flat; brown; 2" to 4" long; $\frac{1}{2}$ " wide; pointed on both ends; contains 8 to 12 brown, hard seeds; perfect flowers.

Bark: Thin; gray; becoming scaly on old trunks with cinnamon-red inner bark.

Wood: Hard; brown. Unimportant for wood products.

General: Native to southeast Nebraska and most of the eastern U.S. Small understory tree. **Beautiful purple-pink flowers** that appear before the leaves in April. Often planted as an ornamental. Shade tolerant.

Cornus florida (Flowering Dogwood)

Leaves: Opposite; simple; oval; 3" to 6" long; **leaf veins parallel to the leaf margin**; entire margin; surfaces hairy; bright green above; paler below; turning scarlet in fall; petiole short.

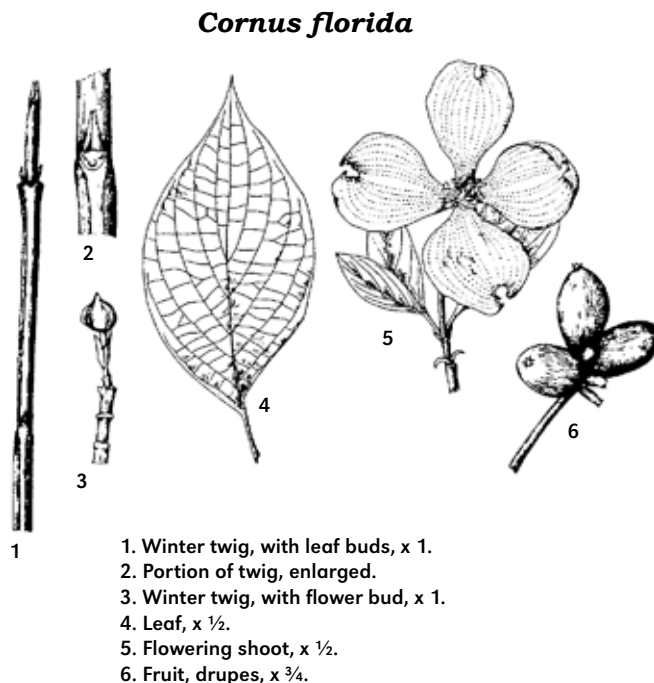
Twigs: Slender; purple; more or less covered with a white, waxy coating. Terminal bud $\frac{1}{8}$ " long, 2 scales meet in a straight line without overlapping; flower buds look like small lanterns or urns on branch tips.

Fruit: Drupe; bright red; about $\frac{1}{3}$ " long; in compact clusters; perfect flowers.

Bark: Thin; dark red-brown; broken into small, square blocks; very distinctive.

Wood: Hard, heavy; sapwood light pink-brown; heartwood dark brown; growth rings distinct, but not sharply delineated; diffuse-porous; rays visible to naked eye. Unimportant for wood products.

General: Native to most of the eastern U.S. A small tree that occurs naturally in the shady understory of other trees. Sometime planted in Nebraska as an ornamental because of its **beautiful white or pink flowers**. Very shade tolerant.



Elaeagnus angustifolia (Russian-olive)

Leaves: Alternate; simple; oblong; $1\frac{1}{2}$ " to 3" long; entire margin; **silvery; scaly**; petiole short.

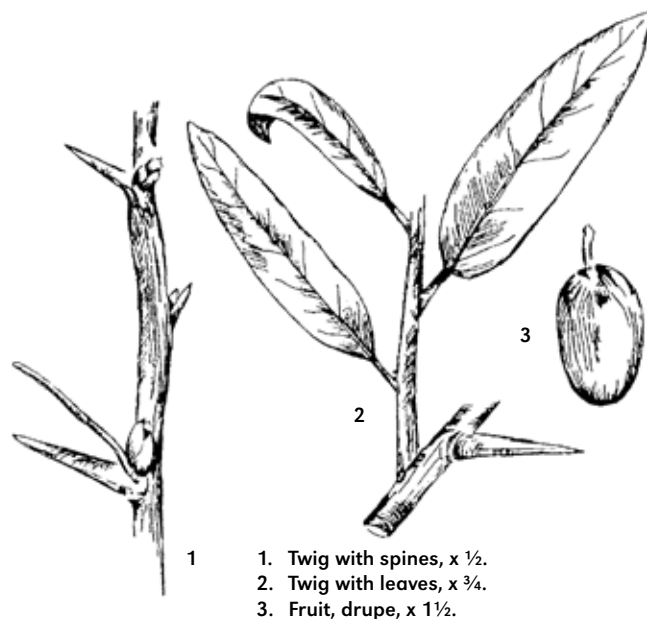
Twigs: Silvery; sometimes with spines. Buds small, round, gray-brown, with 4 exposed, silvery scales.

Fruit: Drupe; silver-yellow; $\frac{1}{4}$ " to $\frac{1}{2}$ " in diameter; perfect flowers.

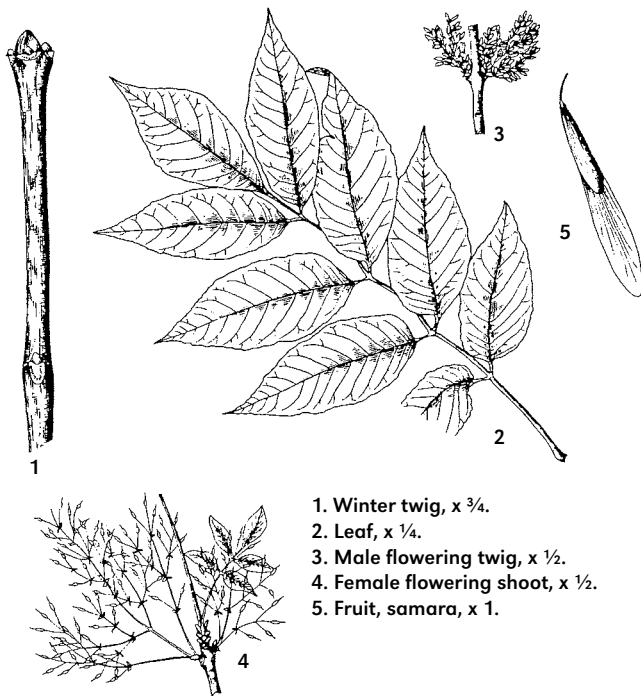
Bark: Gray-brown; shallow furrows with narrow plates between.

Wood: Yellow to brown. Unimportant for wood products.

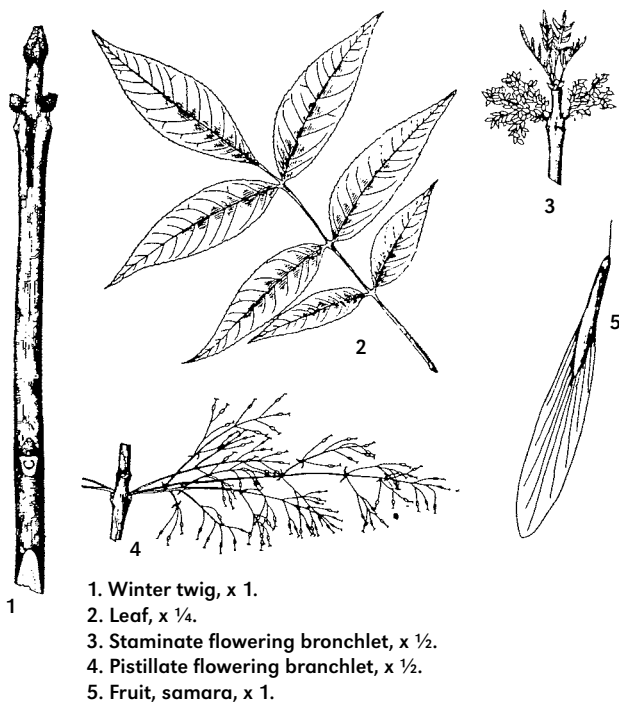
General: Native to Asia and southern Europe. Extensively planted on the Great Plains and is becoming naturalized and considered invasive in riparian areas of western Nebraska. Strongly affected by a stem canker. Shade intolerant.



Fraxinus americana



Fraxinus pennsylvanica



Fraxinus americana (White Ash)

Leaves: Opposite; once pinnately compound; 8" to 12" long; **5 to 9 (mostly 7) leaflets**; leaflets ovate to oblong-lanceolate, 3" to 5" long, glabrous on both sides, margins entire or barely serrate; rachis slightly grooved, glabrous; **turn purple in fall.**

Twigs: Fairly stout; dark green to gray-green, occasionally purplish; glabrous; **leaf scar U-shaped with deep to shallow notch across top edge.** Terminal bud rusty brown, blunt, covered with 4-6 brown scales, glabrous (generally not hairy), lateral buds smaller, almost triangular.

Fruit: Samara; 1" to 2" long; 1/4" wide; paddle-shaped in dense clusters; often clinging to twigs throughout winter; dioecious.

Bark: Gray or yellowish-gray; deeply furrowed and ridged; ridges often flattened. Similar to green ash.

Wood: Heavy, hard, strong; sapwood white; heartwood light brown; growth rings distinct; ring-porous; rays not distinct. Important for wood products; used for tool handles, containers, furniture, lumber, fuel, etc. Best known for baseball bats.

General: Native to extreme southeastern Nebraska and most of the eastern U.S. "Autumn Purple" ash is a popular ornamental variety. A very desirable tree. Intermediate shade tolerance.

Fraxinus pennsylvanica (Green Ash)

Leaves: Opposite; once pinnately compound; 10" to 12" long; 7-9 leaflets; leaflets oblong-lanceolate to elliptic, 4" to 6" long, glabrous on both surfaces, finely serrate margin; **turn bright yellow in fall.**

Twigs: Fairly stout; gray to brown; **leaf scar half-circular, straight or shallowly notched across the upper edge.** Terminal bud rusty brown, conical, hairy; lateral buds smaller.

Fruit: Samara, 1" to 2 1/2" long, 1/4" wide; paddle-shaped in dense clusters; often clinging to twigs throughout the winter; abruptly narrowed wing along the slender seed cavity; dioecious.

Bark: Ash-gray; sometimes with an orange tinge on younger trees; on older trees furrowed into diamond-shaped areas separated by narrow interlacing ridges; distinctive.

Wood: Heavy, hard, strong; similar to white ash in characteristics and uses.

General: Native to most of Nebraska and east of the Rockies, including southern Canada. A tough, durable tree. Drought resistant. Good for wind-breaks and as a shade tree. **Emerald ash borer a potentially destructive pest of all ashes.** Intermediate shade tolerance.

Gleditsia triacanthos (Honeylocust)

Leaves: Alternate; once and/or twice pinnately compound; once pinnately compound leaves with 15 to 30 nearly stalk-less leaflets; twice pinnate leaves with 4 to 7 pairs of 6" to 8" long, lateral "branches"; leaflets ovate to ovate-lanceolate, up to 1½" long by ¾" wide, margins with fine, rounded teeth, leaflet tip pointed or rounded; yellow color in fall.

Twigs: Stout to slender; glabrous; glossy; zigzag; often having stiff, sometimes branched, **brown to red thorns from 3" to 12" long**. No terminal bud; lateral buds small, nearly hidden by bark, 3 or more at each leaf scar.

Fruit: A flat, strap-shaped legume; red-brown; twisted; 12" to 18" long; containing 12 to 14 dark brown, oval seeds; polygamo-dioecious.

Bark: Smooth and gray on younger branches; on older stems becoming gray to nearly black, and broken by vertical furrows into plates or scaly ridges.

Wood: Sapwood yellow; heartwood red-brown; growth rings conspicuous; ring-porous; rays conspicuous to naked eye. Slightly important for wood products; used for veneer and firewood.

General: Native to eastern Nebraska and most of the eastern U.S. Very hardy and drought resistant. Often invades old fields. Thornless, fruitless varieties are commercially available. This species does not fix nitrogen. Shade intolerant.

Gymnocladus dioica (Kentucky Coffeetree)

Leaves: Alternate; twice pinnately compound; very large, **can be 2' to 3' long**; 20 to 40 ovate leaflets, 1½" long, pointed at tip, entire margins.

Twigs: Very stout; brown; glabrous or velvety; pith is wide and salmon-pink. No terminal bud; lateral buds deeply sunken in the bark; brown; hairy; 2 at each leaf scar.

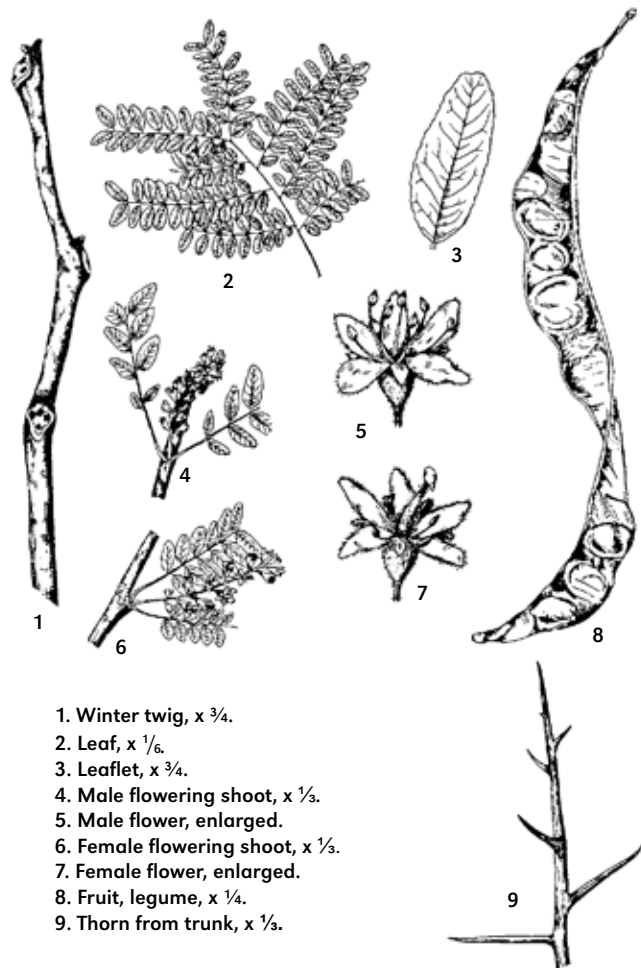
Fruit: A flat legume; red-brown; leathery; **pointed; 4" to 6" long, 1¼" wide**; remaining closed until or through winter; contains 4 to 8 olive-brown, flat, very hard seeds embedded in a sweet pulp; dioecious or polygamo-dioecious.

Bark: Smooth and brown to gray on younger branches; on older stems turning gray, furrowed, with curved scales.

Wood: Sapwood yellow; heartwood red; growth rings conspicuous; ring-porous; rays not conspicuous to naked eye. Unimportant for wood products.

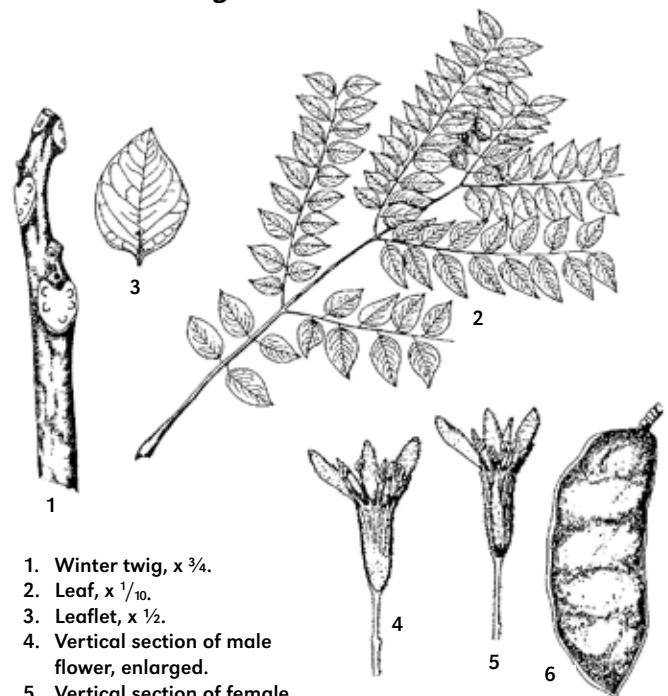
General: Native to eastern Nebraska and most of the central-eastern U.S. Never very common naturally. Seeds ground and used as a coffee substitute by early settlers. Shade intolerant.

Gleditsia triacanthos



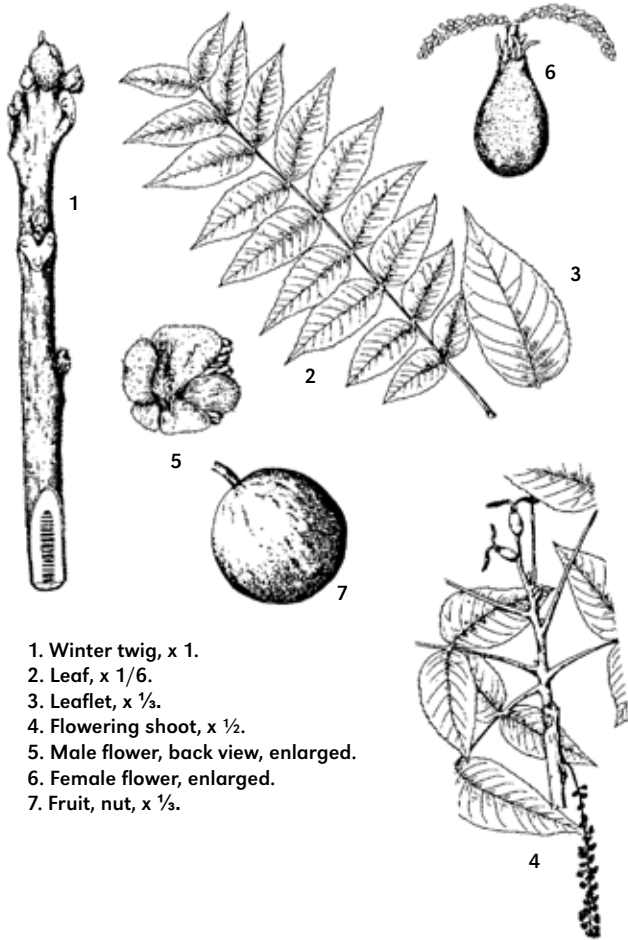
1. Winter twig, x ¾.
2. Leaf, x 1/6.
3. Leaflet, x ¾.
4. Male flowering shoot, x 1/3.
5. Male flower, enlarged.
6. Female flowering shoot, x 1/3.
7. Female flower, enlarged.
8. Fruit, legume, x 1/4.
9. Thorn from trunk, x 1/3.

Gymnocladus dioica



1. Winter twig, x ¾.
2. Leaf, x 1/10.
3. Leaflet, x 1/2.
4. Vertical section of male flower, enlarged.
5. Vertical section of female flower, enlarged.
6. Fruit, legume, x 1/4.

Juglans nigra



1. Winter twig, x 1.
2. Leaf, x 1/6.
3. Leaflet, x 1/3.
4. Flowering shoot, x 1/2.
5. Male flower, back view, enlarged.
6. Female flower, enlarged.
7. Fruit, nut, x 1/3.

Juglans nigra (Black Walnut)

Leaves: Alternate; once pinnately compound; 1' to 2' long, with 15 to 23 leaflets; terminal leaflet often missing; leaflets 3" to 4" long, ovate-lanceolate, serrate margins, glabrous above, hairy below; light yellow-green; characteristic odor when crushed; rachis stout, usually hairy.

Twigs: Stout; light brown; **with yellow-brown to brown, chambered pith.** Terminal bud short and blunt, larger than laterals, hairy; lateral buds much smaller, often with more than one at each leaf scar.

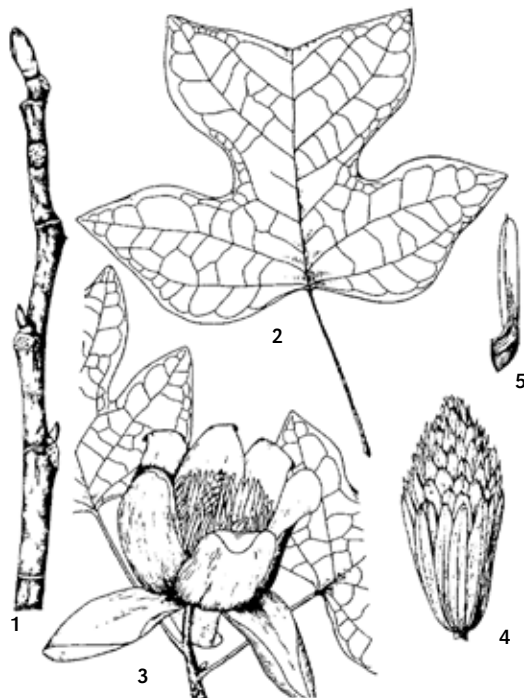
Fruit: Nut; 1½" to 2" diameter; round, covered by a thick, glabrous, yellow-green, fleshy husk that becomes black and wrinkled; **nut with rough, dark, very hard shell** containing sweet, oily, strong-flavored nut meat; monoecious.

Bark: Dark brown to gray-black; broken pieces showing chocolate-brown; intertwining ridges forming a diamond pattern.

Wood: Hard; strong. Sapwood white to light brown; heartwood chestnut-brown; growth rings distinct; semi-ring-porous; rays indistinct; Very important for wood products; used for lumber, fine furniture, gunstocks, veneer; our highest-value hardwood.

General: Native to Nebraska along the Missouri, Republican, and Niobrara Rivers, and across the eastern U.S. Has been planted throughout much of Nebraska. Prefers rich, bottom soils. Under favorable conditions attains a large size. Very shade intolerant.

Liriodendron tulipifera



1. Winter twig, x 3/4.
2. Leaf, x 1/3.
3. Flowering shoot, x 1/3.
4. Fruit, aggregate of samaras, x 1/2.
5. Single samara, x 1/2.

Liriodendron tulipifera (Yellow-poplar, Tuliptree, Tulip-poplar)

Leaves: Alternate; simple; 4" to 6" across, **usually 4-lobed; leaf base and tip flat, leaf shape very distinctive;** entire margin; glabrous; petiole 2" to 4" long.

Twigs: Fairly stout; red-brown; pith divided into chambers. Terminal buds about ½" long, covered with 2 duck-bill-like scales; lateral buds much smaller.

Fruit: An aggregate of deciduous samaras; 2½" to 3" long; held upright; perfect flowers.

Bark: Dark green and smooth on young stems; becoming thick, ash-gray, furrowed, with rough ridges.

Wood: Light yellow sapwood; light yellow to dark brown heartwood; even-textured; diffuse-porous. Very important for wood products; used for furniture, interior finish, boxes, pallets, crates, plywood, etc.

General: Native to the southeastern U.S., from southeast Missouri to Vermont. Has **large, green-yellow flowers** that appear in May or June after the leaves open. Not a true poplar. Shade intolerant.

Maclura pomifera (Osage-orange)

Leaves: Alternate; simple; oblong-lanceolate to ovate; 4" to 5" long, entire margin; with a narrow, pointed tip; dark green and glabrous above; milky juice; petiole $\frac{1}{2}$ " to $1\frac{1}{2}$ " long.

Twigs: Stout; orange-brown; hairy; **armed with stout, sharp-pointed thorns.** No terminal bud; lateral buds small, round, brown, partially embedded in bark.

Fruit: A pale green, orange-like aggregate of many small drupes; 4" to 5" in diameter; containing a bitter, milky juice; becoming woody; dioecious.

Bark: Thin; dark orange-brown; furrowed with flat ridges.

Wood: Characteristic bright orange color; very hard and dense; ring-porous; yields a yellow dye. Moderate important for wood products; used primarily for fence posts and firewood. Also used to make bows, thus the tree is sometimes called "bois d'arc" (pronounced "bodark") or "bow wood."

General: Native to Arkansas, Oklahoma, and Texas, but was extensively planted as a hedges or wind-breaks by early Nebraska settlers. In Nebraska, the typical height is less than 30 feet. Very tough tree. Shade intolerant.

Malus spp. (Apple and Crabapple)

Leaves: Alternate; simple; variably egg-shaped or elliptical to oblong; serrate margin; sometimes lobed and/or white-hairy below.

Twigs: Red-brown; somewhat woolly; characteristic sweet taste. Terminal bud **woolly (particularly at tip)**, blunt; lateral buds similar but smaller.

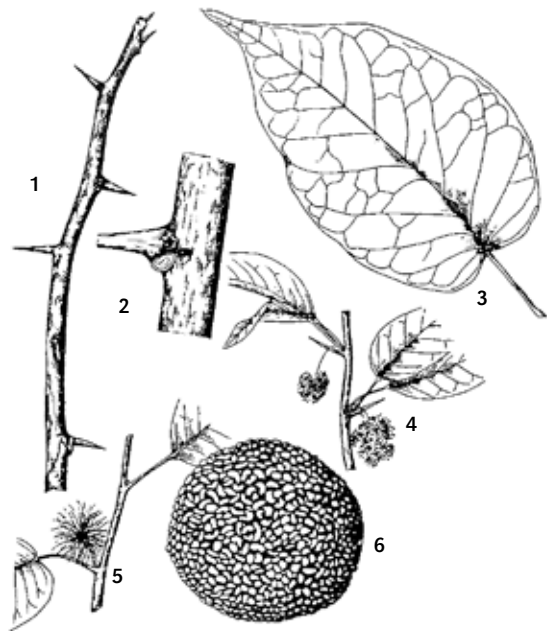
Fruit: **Pome;** red, yellow, or green; perfect flowers.

Bark: Thin; red-brown to gray-brown; divided by shallow furrows into wide, scaly ridges.

Wood: Heavy, weak; unimportant for wood products; used for fuelwood.

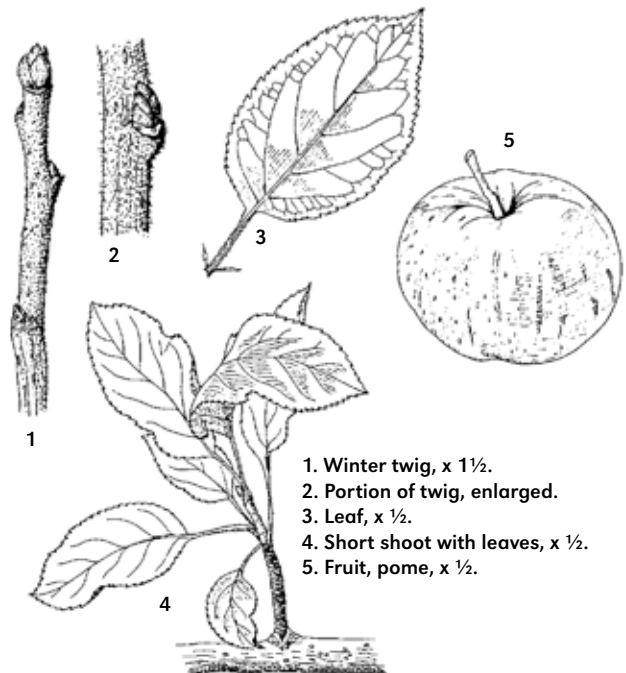
General: The western crabapple (*Malus ioensis*) is the only native apple species found in Nebraska. Many cultivated crabapples make excellent ornamental trees. Most cultivars or varieties of "eating apples" are of European or Asiatic origin and must be propagated by grafting. Shade tolerant.

Maclura pomifera



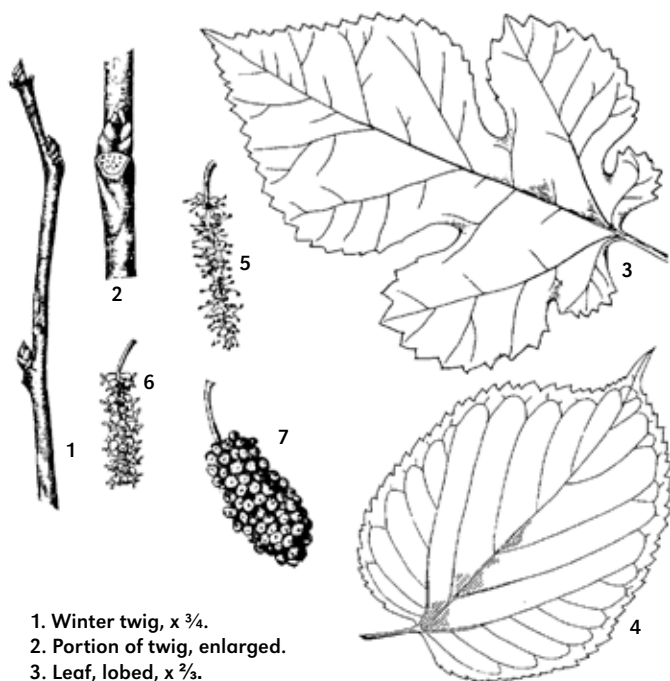
1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Male flowering shoot, x $\frac{1}{2}$.
5. Female flowering shoot, x $\frac{1}{2}$.
6. Fruit, multiple of drupes, x $\frac{1}{4}$.

Malus spp.



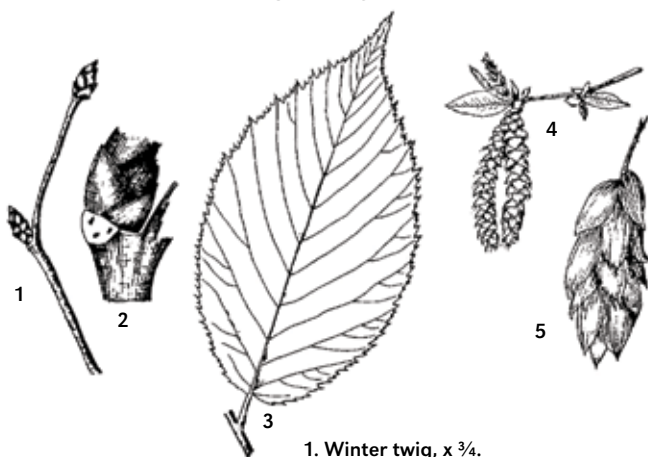
1. Winter twig, x $1\frac{1}{2}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Short shoot with leaves, x $\frac{1}{2}$.
5. Fruit, pome, x $\frac{1}{2}$.

Morus rubra



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, lobed, x $\frac{2}{3}$.
4. Leaf, unlobed, x $\frac{1}{2}$.
5. Catkin of male flowers, x $\frac{3}{4}$.
6. Catkin of female flowers, x $\frac{3}{4}$.
7. Fruit, multiple of drupes, x $\frac{3}{4}$.

Ostrya virginiana



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{1}{2}$.
4. Flowering shoot, x $\frac{1}{3}$.
5. Fruit, x $\frac{1}{3}$.

Morus rubra (Red Mulberry)

Leaves: Alternate; simple; nearly orbicular; 3" to 5" long; variable in shape; **unlobed or 3 to 5 lobes**; coarsely serrate margin; hairy beneath; petiole $\frac{1}{2}$ " to 1" long.

Twigs: Slender; somewhat zigzag; red-brown to green-brown; showing milky sap when cut. No terminal bud; lateral buds ovoid, pointed, $\frac{1}{4}$ " long, light brown.

Fruit: **Fleshy aggregate of small drupes; resemble blackberries**; dark purple or nearly black; $\frac{1}{2}$ " to $\frac{3}{4}$ " long; juicy; ripening in June or July; dioecious.

Bark: Thin; dark brown to orange-brown; scaly and furrowed; bark of roots yellow.

Wood: Sapwood yellow; heartwood yellow-brown; growth rings distinct; ring-porous; rays plainly visible to naked eye. Seldom used for wood products.

General: Native to eastern Nebraska and most of the eastern U.S. Usually found in the forest understory on rich, moist sites. Shade tolerant. The introduced **White mulberry** (*Morus alba*), a native of China, is often mistaken for native red mulberry. White mulberry has been widely planted in the U.S. and is now naturalized and often hybridized with native red mulberry. Its leaves are similar, but thicker and shinier than red mulberry. The fruit is also similar, but can vary in color from white to purple.

Ostrya virginiana (Eastern Hophornbeam, Ironwood)

Leaves: Alternate; simple; oblong-ovate; 3" to 5" long; sharply, doubly serrate margin; thin; dark green above, paler and somewhat hairy below; petiole short, hairy.

Twigs: Slender; red-brown to dark brown. No terminal bud; lateral buds pointed, scales with green bases and brown tips.

Fruit: Small nut; enclosed in oval, flattened, papery **sacks arranged in cone-like clusters, with the appearance of hops**; monoecious.

Bark: Thin; gray-brown; broken into small, shaggy plates.

Wood: Extremely hard and tough, thus called "ironwood"; resembles hickory; diffuse-porous. Seldom used for wood products.

General: Native to eastern Nebraska and along the Niobrara River, and in much of the eastern U.S. Typically found in the forest understory on dry slopes. Slow growing. Shade tolerant.

Platanus occidentalis (American Sycamore, American Planetree)

Leaves: Alternate; simple; 3" to 8" wide and long; more or less deeply 3 to 5 lobed; margin of lobes coarsely serrate; bright green and glabrous above; paler and hairy along veins below; petioles 2" to 3" long, hollow at the base.

Twigs: Moderately slender; orange-brown; zigzag. No terminal bud; lateral buds conical, resinous, covered by a single cap-like scale and hidden under hollow petiole base.

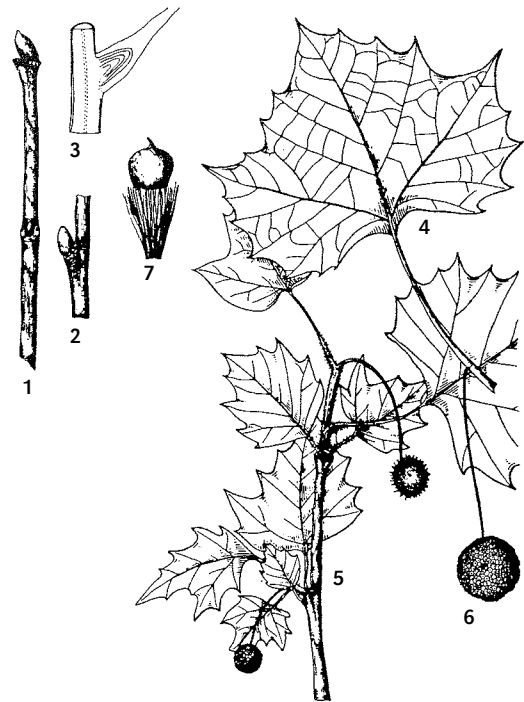
Fruit: Round, **yellow-brown head or ball of achenes** about 1" in diameter that hangs from slender, 3" to 6" long stem; heads usually occur singly; often persists through the winter; monoecious.

Bark: Brown on younger branches; soon becomes mottled (brown and white) as brown outer bark peels off, showing the **creamy-white, smooth inner bark**; bark on lower trunk of older trees brown and scaly; very distinctive.

Wood: Sapwood light yellow; heartwood light to dark brown; growth rings distinct; diffuse-porous; rays conspicuous to naked eye. Somewhat important for wood products; used for boxes, furniture, railroad ties.

General: Native to Nebraska along the Missouri River as far north as Omaha, and to most of the eastern U.S. Has been planted in all sections of Nebraska. Usually found naturally along streams. Can get very large. Very shade intolerant.

Platanus occidentalis



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, side view, x $\frac{3}{4}$.
3. Vertical section of twig, summer bud, and leaf petiole, enlarged.
4. Leaf, x $\frac{1}{5}$.
5. Flowering shoots, x $\frac{1}{2}$.
6. Fruit, multiple of achenes, x $\frac{1}{5}$.
7. Achene, enlarged.

Populus alba (White Poplar)

Leaves: Alternate; simple; resembles a maple leaf in shape with very coarse teeth or lobes on margin; base rounded; 1" to 4" long; dark green and glabrous above; **white and woolly below**; petioles hairy, round, $\frac{1}{2}$ " to $1\frac{1}{2}$ " long.

Twigs: Slender; green-gray; covered with fine white hairs. Terminal bud more or less woolly.

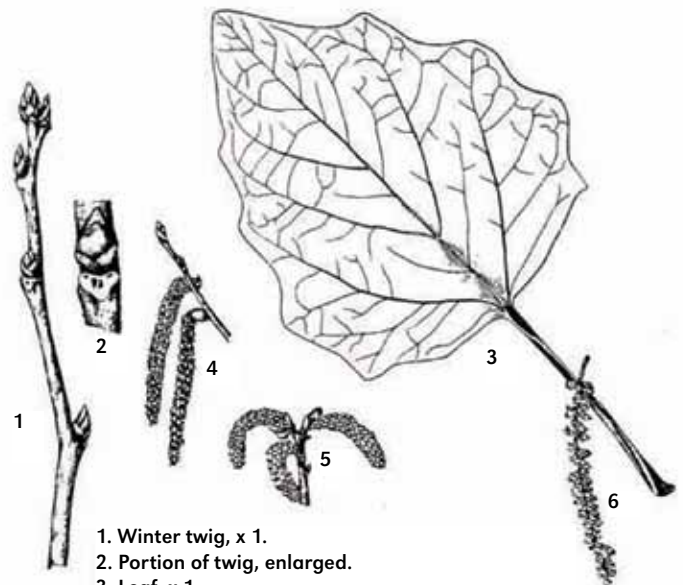
Fruit: A small capsule in necklace-like strings; seeds very small; capsules contain a large amount of cottony material in addition to seeds; dioecious.

Bark: **Green-white to bright white**; with dark cracks and ridges when older; very characteristic.

Wood: Similar to other poplars; diffuse-porous. Unimportant for wood products.

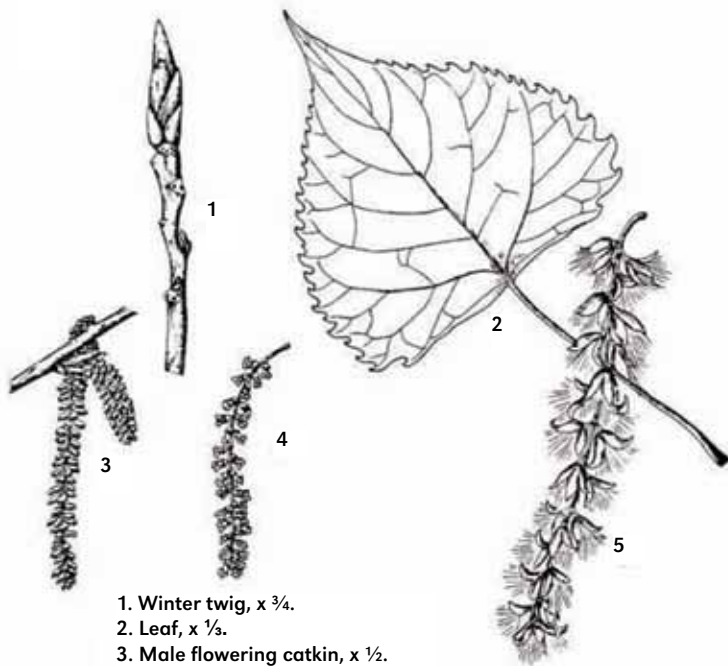
General: Native to Europe. Often wrongly called silver maple. A large tree, grows rapidly on favorable sites, but also thrives under less favorable conditions. Many root suckers (sprouts) occur around the tree. Very shade intolerant.

Populus alba



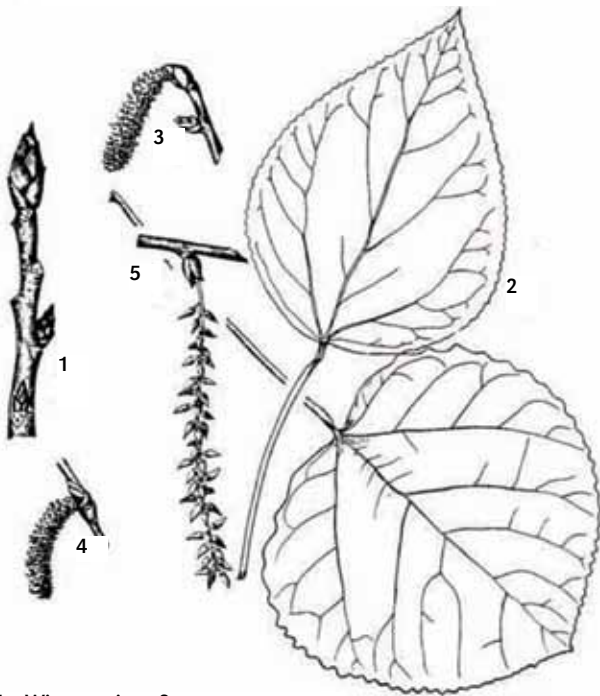
1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x 1.
4. Male flowering catkins, x $\frac{1}{2}$.
5. Female flowering catkins, x $\frac{1}{2}$.
6. Fruiting catkin with open capsules, x $\frac{1}{2}$.

Populus deltoides



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{3}$.
3. Male flowering catkin, x $\frac{1}{2}$.
4. Female catkin, x $\frac{1}{2}$.
5. Fruiting catkin with open capsules, x $\frac{1}{2}$.

Populus tremuloides



1. Winter twig, x 2.
2. Leaves, x $\frac{3}{4}$.
3. Male flowering catkin, x $\frac{1}{2}$.
4. Female flowering catkin, x $\frac{1}{2}$.
5. Fruiting catkin with capsules, x $\frac{1}{2}$.

Populus deltoides (Eastern Cottonwood)

Leaves: Simple; alternate; **deltoid to ovate-deltoid**; 3" to 6" long, 4" to 5" wide; rounded teeth on margin, glabrous; turn bright gold in fall; petiole $1\frac{1}{2}$ " to 3" long, **flattened laterally**, causing leaf to flutter in the wind.

Twigs: Yellow-brown; sticky; angular. Terminal buds $\frac{3}{4}$ " long, pointed, shiny-brown, resinous, fragrant when crushed; lateral buds smaller.

Fruit: Small capsule; about $\frac{1}{3}$ " long; borne is loosely arranged, 5" to 8"; pendulous catkins; capsules contain many small, cottony seeds; dioecious.

Bark: Yellow-green and smooth on young trunks; on older trunks thick, gray, deeply furrowed with flat-topped ridges.

Wood: Light, soft, close-grained; sapwood white, heartwood gray; often not a clearly defined change from sapwood to heartwood; growth rings unclear, diffuse-porous, rays not visible without magnification. Very important for wood products; used in lumber, pallets, veneer.

General: **State tree of Nebraska.** Native to most of Nebraska and most of the eastern U.S. Usually found along streams and lakes. Very easily propagated by planting a piece of a young branch in moist soil. Very shade intolerant. **Plains cottonwood** (*Populus sargentii*), found in western Nebraska, is considered a variety of eastern cottonwood.

Populus tremuloides (Quaking Aspen, Trembling Aspen)

Leaves: Simple, alternate; **nearly round to broadly ovate**; $1\frac{1}{2}$ " to 3" diameter, finely serrate margin; pointed apex; glabrous; yellow-green to green, turning bright yellow to orange in fall; petiole $1\frac{1}{2}$ " to 3" long, **flattened laterally**, causing leaf to flutter in the wind.

Twigs: Slender; glabrous; red-brown. Terminal bud $\frac{1}{4}$ " to $\frac{1}{2}$ " long, sharp-pointed, sometimes resinous, covered by red-brown overlapping scales; lateral buds smaller, curve inward.

Fruit: Small capsule; narrow conical; $\frac{1}{4}$ " long; gray, hairy; seeds small, cottony, light brown; dioecious.

Bark: Smooth; green-white to cream colored, becomes furrowed on older trunks.

Wood: Straight grained; fine textured; heartwood gray-white to light gray-brown; sapwood lighter and merges gradually into heartwood, growth rings unclear; diffuse-porous. Important for wood products; used for lumber, pallets, crates, pulp, and matches.

General: Native to northern Nebraska and most of northern and western U.S. and Canada. Often regenerates through root sprouts. Relatively short-lived. Very shade intolerant.

Prunus serotina (Black Cherry)

Leaves: Alternate; simple; oval to oblong-lanceolate; about 3" long and half as wide; dark green and glabrous above, paler beneath; **dense red-brown hairs along base of midrib on underside of leaf**; finely serrate margin with **incurved teeth**; petiole $\frac{1}{4}$ " to 1" long, conspicuous gland or bump on each side.

Twigs: Slender; usually bitter to taste; red to brown. Terminal bud $\frac{1}{4}$ " long, scaly, light brown; lateral buds same size as terminal.

Fruit: Drupe; dark red to nearly black; round; about $\frac{1}{3}$ " in diameter; edible; bitter; perfect flowers.

Bark: On young stems smooth, red-brown to nearly black, with obvious horizontal corky lines; on older stems peeling into small, platy scales with upturned edges.

Wood: Sapwood light brown; heartwood light to dark red-brown; growth rings fairly distinct; semi-ring-porous; rays plainly visible to the naked eye. Important for wood products; used for high-value furniture and cabinets.

General: Native to southeastern Nebraska and most of the eastern U.S. Attractive, white flowers appear in bunches in May. Often occurs naturally along fence rows, in open areas, and on the edge of woodlands. Intermediate shade tolerance.

Quercus alba (White Oak)

Leaves: Alternate; simple; oblong to obovate; 5" to 9" long, 2" to 4" wide; margin with 7 to 9 **rounded lobes**; deep to shallow areas between lobes; bright green and glabrous above; paler below; turns brown to deep red in fall; often remain on the tree through winter; petiole 1" long.

Twigs: Moderately stout; purple-gray to green-red; without corky ridges. Terminal buds $\frac{1}{8}$ " to $\frac{3}{16}$ " long, round to oval, clustered at end of twig; red-brown, glabrous; lateral buds similar, but smaller.

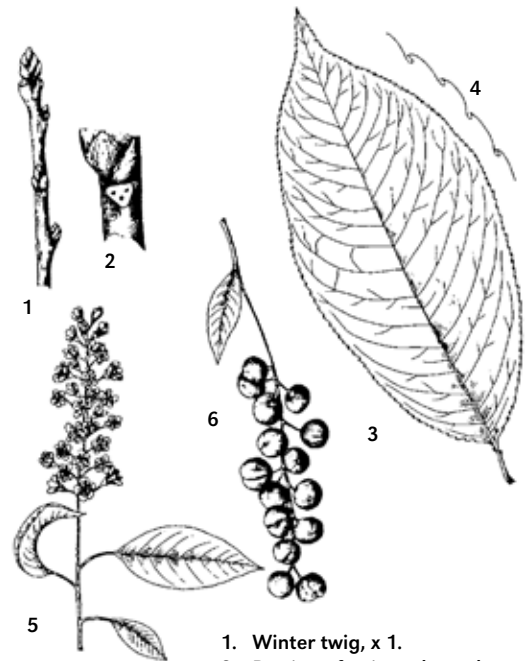
Fruit: Acorn; no stalk or short-stalked: $\frac{1}{2}$ " to $\frac{3}{4}$ " long; **cap with warty scales covers $\frac{1}{4}$ of the acorn**; matures in one season; monoecious.

Bark: Light ash-gray; variable; young to medium-sized trees with chunky, vertical blocks, older trees with scaly plates attached at one side.

Wood: Hard, heavy, tough; sapwood white to light brown; heartwood gray-brown; growth rings very distinct; ring-porous; rays visible to naked eye; pores normally filled by hardened bubbles (tyloses). Very important for wood products; used for lumber, furniture, floors, barrels, etc.

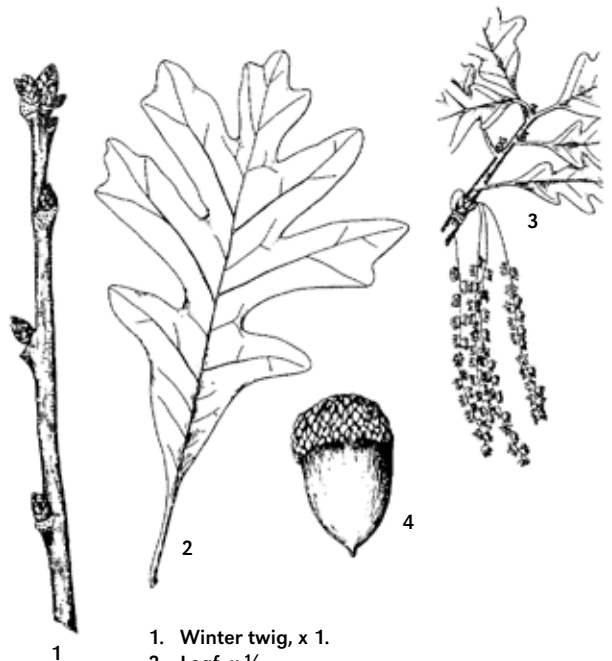
General: Native to extreme southeastern Nebraska and the eastern U.S. It is long-lived and drought tolerant. White oak leaves often resemble bur oak leaves, but acorns are very different. Good as an ornamental. Intermediate shade tolerance.

Prunus serotina



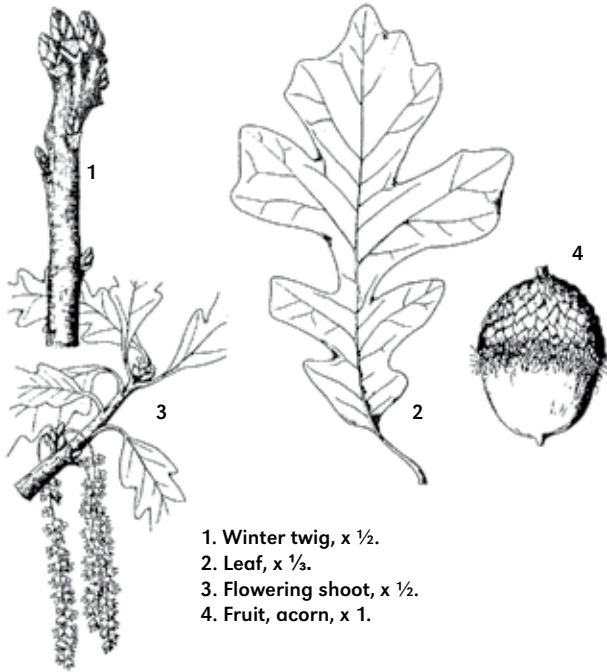
1. Winter twig, x 1.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{2}{3}$.
4. Margin of leaf, enlarged.
5. Flowering shoot, x $\frac{1}{2}$.
6. Fruiting shoot with drupes, x $\frac{1}{2}$.

Quercus alba



1. Winter twig, x 1.
2. Leaf, x $\frac{1}{3}$.
3. Flowering shoot, x $\frac{1}{2}$.
4. Fruit, acorn, x 1.

Quercus macrocarpa



1. Winter twig, x $\frac{1}{2}$.
2. Leaf, x $\frac{1}{3}$.
3. Flowering shoot, x $\frac{1}{2}$.
4. Fruit, acorn, x 1.

Quercus macrocarpa (Bur Oak, Mossycup Oak)

Leaves: Alternate; simple; oblong to obovate; 6" to 10" long, 3" to 5" wide; margin with 5 to 9 **rounded lobes**; variable shape; dark green and glabrous above; pale and hairy below; petiole 1" long, hairy.

Twigs: Stout; yellow-brown; becoming ashen or brown; hairy; **often with corky ridges**. Terminal buds clustered at end of twig, blunt; lateral buds smaller.

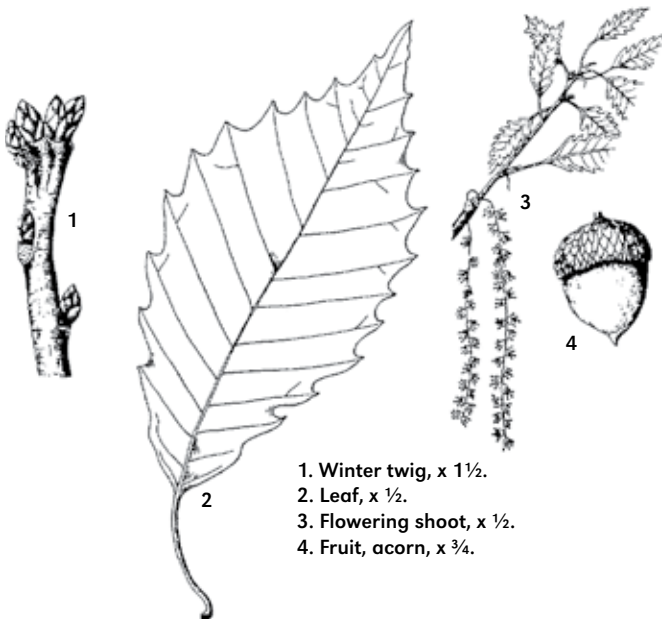
Fruit: Acorn; short-stalked; about 1" long; $\frac{1}{2}$ or **more enclosed by fringed cap**; matures in one season; monoecious.

Bark: Thick; gray-brown; deeply furrowed and ridged.

Wood: Hard, heavy, tough; sapwood white to light brown; heartwood light to dark brown; growth rings very distinct; ring-porous; rays visible to naked eye; pores normally filled by hardened bubbles (tyloses). Important for wood products; used for lumber, furniture, barrels, etc.

General: Native to eastern half of Nebraska and the eastern U.S. except for the extreme southeast. An important tree species in Nebraska, where it occurs on the edge of the prairie. It is long lived and drought tolerant. Valuable as an ornamental. Intermediate shade tolerance.

Quercus muehlenbergii



1. Winter twig, x $1\frac{1}{2}$.
2. Leaf, x $\frac{1}{2}$.
3. Flowering shoot, x $\frac{1}{2}$.
4. Fruit, acorn, x $\frac{3}{4}$.

Quercus muehlenbergii (Chinkapin Oak)

Leaves: Alternate; simple; obovate to oblong-lanceolate; 4" to 7" long; **coarsely serrate margin with sharp teeth**; thick; glabrous; yellow-green above; paler and hairy below; petiole 1" to $1\frac{1}{4}$ " long.

Twigs: Slender; orange-brown. Terminal buds small, clustered, orange-brown.

Fruit: Acorn; short-stalked; $\frac{1}{2}$ " to $\frac{3}{4}$ " long; chestnut-brown to dark brown; **shallow cap with hairy scales encloses $\frac{1}{2}$ of the acorn**; matures in one season; monoecious.

Bark: Ash-gray; roughly furrowed or scaly.

Wood: Moderately important for wood products; similar to bur oak with similar uses, but less common.

General: Native to extreme southeast Nebraska and most of the eastern U.S. Found in Nebraska mostly on dry, wooded sites near the Missouri River. Intermediate shade tolerance.

Quercus palustris (Pin Oak)

Leaves: Alternate; simple; obovate to broadly oval; 3" to 6" long, 2" to 5" wide; margin with 5 to 7, sometimes 9 lobes; **openings between lobes extending $\frac{1}{3}$ or more to the midrib**; lobes bristle-tipped; bright green and glabrous above; paler below; turning deep scarlet in autumn; often remain on the tree through winter; petiole up to 2" long, slender.

Twigs: Slender; red-brown. Terminal buds clustered, $\frac{1}{8}$ " long, oval, with red-brown scales; lateral buds similar, but smaller.

Fruit: Acorn; $\frac{1}{2}$ " long, light brown, **often striped**, nearly hemispherical; thin, saucer-like cap encloses acorn only at the base; matures in two seasons; monoecious.

Bark: Thick; gray-brown; smooth for many years; eventually with low, scaly ridges.

Wood: Similar to northern red oak. Important for wood products.

General: Native to east-central U.S. but widely planted in Nebraska as an ornamental. Often suffers from iron chlorosis. Shade intolerant.

Quercus rubra (Northern Red Oak)

Leaves: Alternate; simple; oblong to obovate; 5" to 8" long, 4" to 5" wide; **7 to 11 coarse-serrate, pointed lobes on margin**; dark green, glabrous, and lustrous to dull above; paler beneath, but with occasional small tufts of hair where veins meet; often turning rich red in autumn; petiole 1" to 2" long, yellowish, glabrous.

Twigs: Moderately stout; red-brown to green-brown. Terminal buds $\frac{1}{4}$ " long, clustered, pointed, with many red-brown scales; lateral buds smaller.

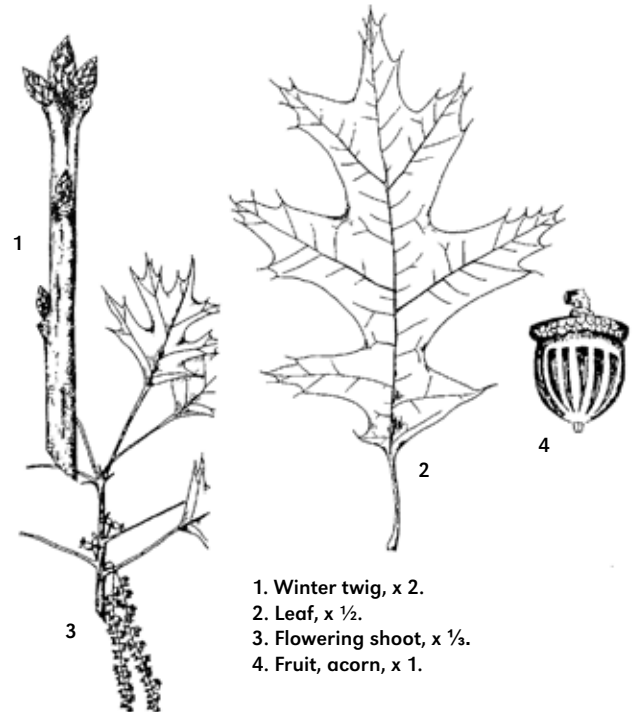
Fruit: Acorn; 1" long, red-brown, inner surface of nut shell woolly; cap shallow, saucer-shaped, usually covering only the base of the nut; matures in two seasons; monoecious.

Bark: Smooth on young stems; eventually brown to nearly black with shallow furrows and wide, flat-topped ridges.

Wood: Heavy, hard, strong; sapwood white to pale, red-brown; heartwood pink to light red-brown; growth rings very distinct; ring-porous; rays conspicuous to naked eye. Very important for wood products; used for flooring, cabinets, and furniture.

General: Native to eastern Nebraska and most of the eastern U.S. Makes an attractive ornamental tree without the chlorosis problems of pin oak. Good red fall color. Usually found naturally on fairly good sites. Intermediate shade tolerance.

Quercus palustris



1. Winter twig, x 2.
2. Leaf, x $\frac{1}{2}$.
3. Flowering shoot, x $\frac{1}{3}$.
4. Fruit, acorn, x 1.

Illustration 4 by Renee Lanik.

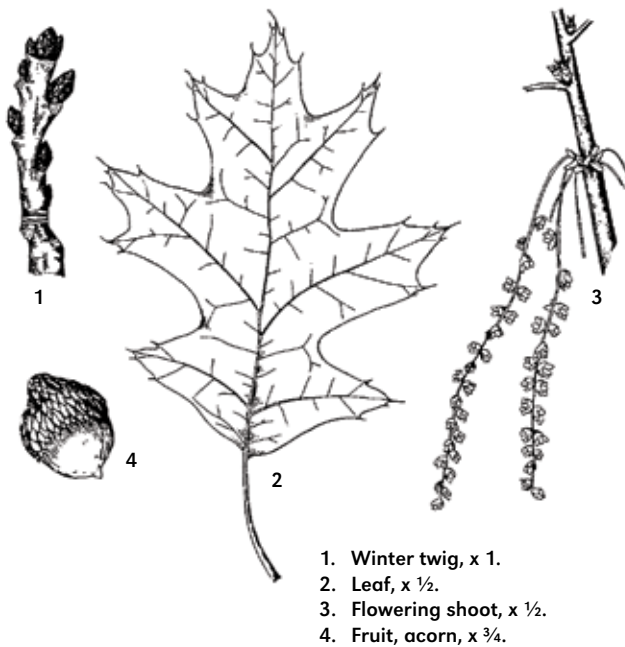
Quercus rubra



1. Winter leaf, x 1,
2. Leaf, x $\frac{1}{2}$.
3. Flowering shoot, x $\frac{1}{2}$.
4. Fruit, acorn, x 1.

Illustration 4 by Renee Lanik

Quercus velutina



Quercus velutina (Black Oak)

Leaves: Alternate; simple; obovate to ovate; 5" to 7" long, 3" to 5" wide; margin with **5 to 7 pointed lobes**; dark green and very glossy above; yellow-green to somewhat copper colored below; glabrous to hairy, with obvious tufts of hair where veins meet; petiole 1" to 2½" long.

Twigs: Stout; red-brown; glabrous. Terminal buds ¼" long, pointed, angled, gray and woolly; lateral buds smaller.

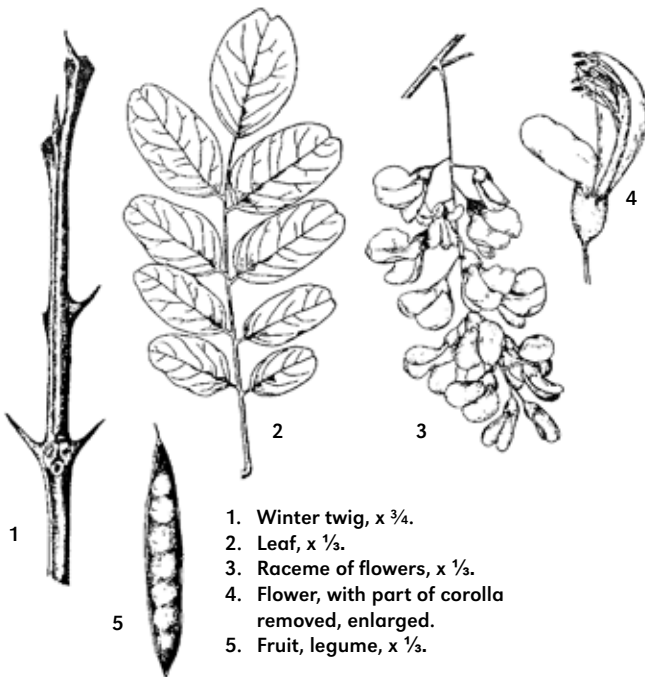
Fruit: Acorn; essentially no stalk; nut oval, ½" to ¾" long, red-brown; cap with thin, loose, hairy, pointed scales encloses ¼ to ⅓ of acorn; matures in two seasons; monoecious.

Bark: Thick; nearly black on old stems; deeply furrowed vertically with many horizontal breaks; inner bark orange-yellow.

Wood: Similar to northern red oak. Important for wood products.

General: Native to extreme southeast Nebraska and most of eastern U.S. Generally found naturally on poor to good, upland sites. Intermediate shade tolerance.

Robinia pseudoacacia



Robinia pseudoacacia (Black Locust)

Leaves: Alternate; once pinnately compound; 8" to 14" long; 7 to 19 elliptical, ovate-oblong, or ovate leaflets, entire margins.

Twigs: Moderately stout; often zigzag; generally have **short, stiff spines, ¼" to ½" long, in pairs at bases of leaves**. No terminal bud; lateral buds hidden under cracks of bark near leaf scar.

Fruit. A dark brown, flat legume; 3" to 5" long; containing 4-8 flat brown seeds; perfect flowers.

Bark: Red-brown to nearly black; deeply furrowed into criss-crossing scaly ridges; inner bark may be poisonous.

Wood: Heavy, very strong, durable; sapwood yellow; heartwood yellow to golden-brown and rot-resistant; growth rings distinct; ring-porous; rays generally visible to the naked eye. Moderately important for wood products; used for fence posts, railroad ties, etc.

General: Native to the central-eastern U.S., but widely planted and naturalized east of the Rockies. Fast growing; **has very attractive, fragrant, white flowers**. Unfortunately, often infested with wood borers. Shade intolerant.

Salix nigra (Black Willow)

Leaves: Simple; alternate; lanceolate; serrate margin; 3" to 6" long, $\frac{3}{8}$ " to $\frac{3}{4}$ " wide; **green above and below**; petiole short.

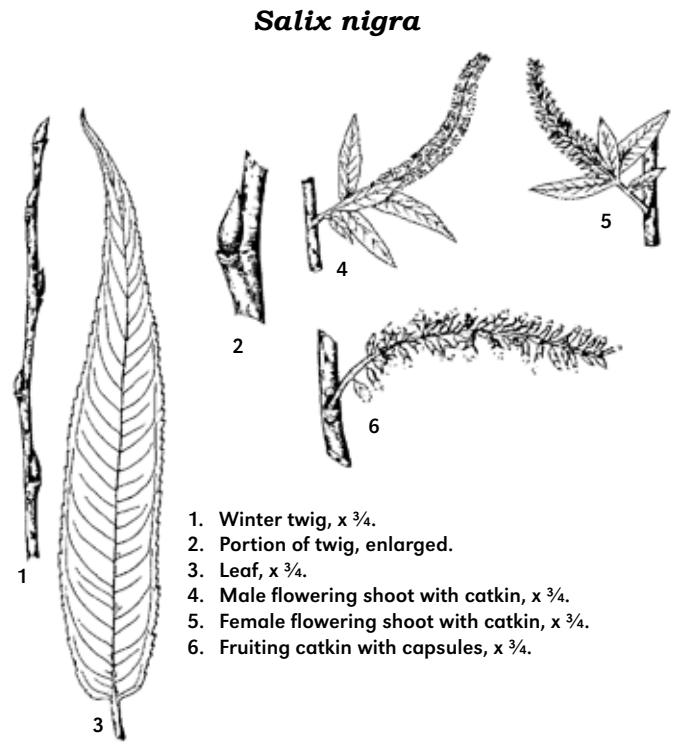
Twigs: Slender to stout; often brittle. No terminal bud; lateral buds red-brown, small, covered by a single cap-like scale.

Fruit: **Small capsule; about $\frac{1}{4}$ " long**; short-stalked; seeds very small, hairy; dioecious.

Bark: Brown to nearly black; thick on older trees; intertwining ridges.

Wood: Soft, weak; sapwood white; heartwood light brown to red-brown; growth rings unclear; diffuse-porous; rays barely visible with a hand lens. Moderately important for wood products; used for pulp, charcoal, and lumber.

General: Native to eastern Nebraska and most of the eastern U.S. Usually found on moist soils along the banks of streams and lakes. Grows rapidly and matures in 50 to 70 years. Can get very large. Very shade intolerant.



1. Winter twig, x $\frac{3}{4}$.
2. Portion of twig, enlarged.
3. Leaf, x $\frac{3}{4}$.
4. Male flowering shoot with catkin, x $\frac{3}{4}$.
5. Female flowering shoot with catkin, x $\frac{3}{4}$.
6. Fruiting catkin with capsules, x $\frac{3}{4}$.

Tilia americana (American Basswood, American Linden)

Leaves: Alternate; simple; **heart-shaped; 5" to 6" long and almost as wide**; coarsely serrate margin; pointed tip; glabrous; dark green above; paler below; petiole thin, 1" to 2" long.

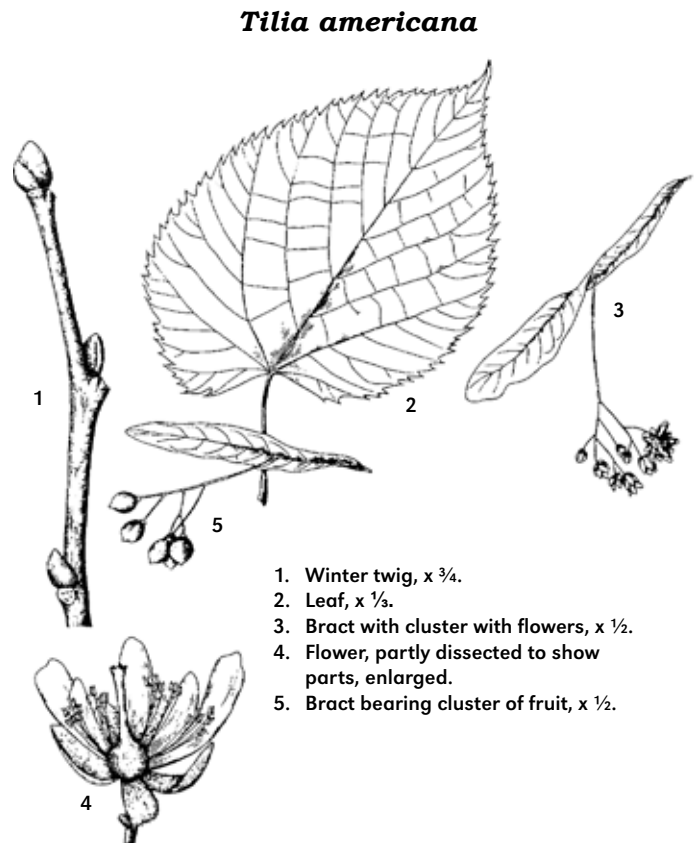
Twigs: Usually zigzag; glabrous; green to red-gray. No terminal bud; lateral buds dark red or green, about $\frac{1}{4}$ " long, rounded, lopsided, usually with two visible scales.

Fruit: Nut-like drupe; round; $\frac{1}{3}$ " to $\frac{1}{2}$ " in diameter; clustered; **attached to leafy bract**; perfect flowers.

Bark: Smooth and gray-green on young stems; later turning gray-brown, furrowed, with narrow, scaly ridges.

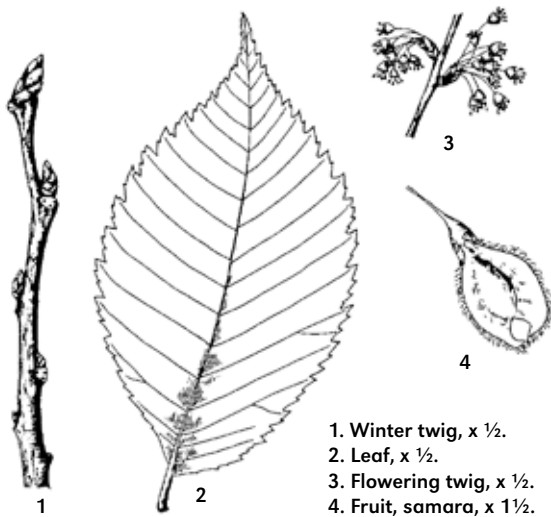
Wood: Light, soft; sapwood white to pale brown; heartwood pale brown; growth rings fairly distinct; diffuse-porous; rays not visible without a hand lens; Important for wood products; used for novelties, excelsior, containers, etc. Excellent carving wood.

General: Native to eastern Nebraska and most of the northern and eastern U.S. Does best in rich, moist woodlands and along river bottoms. Several varieties and other *Tilia* species are commonly planted as ornamentals in Nebraska. Shade tolerant.



1. Winter twig, x $\frac{3}{4}$.
2. Leaf, x $\frac{1}{3}$.
3. Bract with cluster with flowers, x $\frac{1}{2}$.
4. Flower, partly dissected to show parts, enlarged.
5. Bract bearing cluster of fruit, x $\frac{1}{2}$.

Ulmus americana



Ulmus americana (American Elm, White Elm)

Leaves: Alternate; simple; oblong-obovate to elliptic; 4" to 6" long; 1" to 3" wide; coarsely doubly serrate margin; dark green and **glabrous or slightly rough above**; pale and glabrous or somewhat hairy below; unequal base; petiole very short.

Twigs: Slender; zigzag; generally glabrous; brown. No terminal bud; lateral buds 1/8" to 1/4" long; acute; flattened toward the twig; smooth; chestnut-brown.

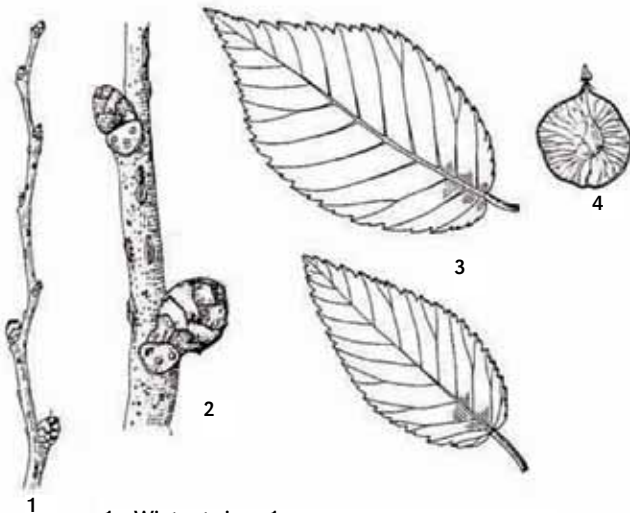
Fruit: Samara; about 1/2" long; oval; a flat, thin wing around the seed; wing hairy-fringed and **notched at tip**; **seed cavity distinct**; ripens in spring; perfect flowers.

Bark: Ash-gray; divided into flat-topped ridges with diamond-shaped furrows in between; on older trees can become rough and without a definite pattern; **outer bark has alternating light and dark layers.**

Wood: Heavy, hard, strong; sapwood gray to light brown; heartwood light brown to brown; growth rings distinct; ring-porous; rays not distinct to naked eye. Important for wood products; used for boxes, crates, furniture, and veneer.

General: Native to most of Nebraska and the eastern U.S. Formerly widely planted as a street tree, but has been largely decimated by Dutch elm disease. Intermediate shade tolerance.

Ulmus pumila



Ulmus pumila (Siberian Elm)

Leaves: Alternate; simple; elliptic to elliptic-lanceolate; **1" to 3" long**, 1/3" to 1" wide; singly serrate margin; usually nearly equal at base; **dark green and glabrous above**; glabrous or slightly hairy below; petiole very short.

Twigs: Slender; gray; glabrous or slightly hairy. No terminal bud; lateral buds spherical, bud scales tipped with long hairs.

Fruit: Samara; 1/2" long; round; wing as in other elms, **wing margin deeply notched with overlapping tips**; **ripens in spring**; perfect flowers.

Bark: Gray; rough; with shallow furrows and long, flat ridges.

Wood: Similar to American elm, but not important for wood products.

General: Native to Siberia, China, and Korea. Much planted and naturalized throughout Nebraska. Commonly, but incorrectly, called Chinese elm. Grows fast, but has many undesirable features. Intermediate shade tolerance.

Ulmus rubra (Slippery Elm, Red Elm)

Leaves: Alternate; simple; elliptic to obovate; 5" to 7" long; 2" to 3" wide; oval; coarsely doubly serrate margin; base uneven; **very rough textured above;** soft and hairy below; petiole very short.

Twigs: Stouter than American elm; ash-gray; rough. No terminal bud; lateral buds $\frac{1}{4}$ " long, obtuse nearly black; hairy.

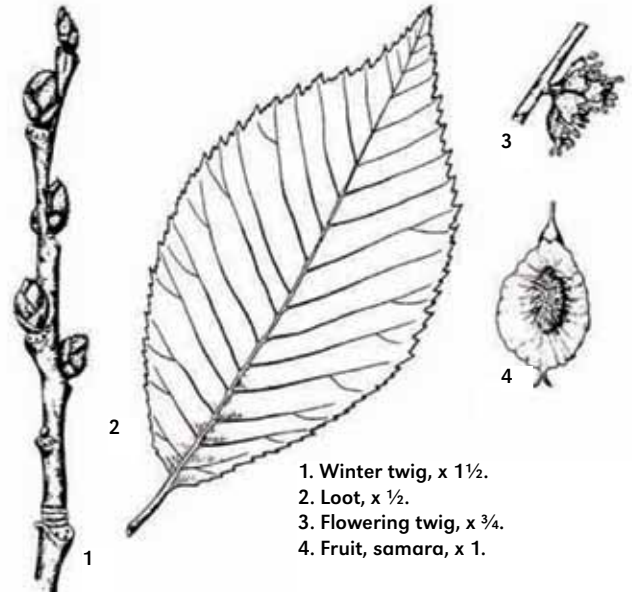
Fruit: Samara; about $\frac{3}{4}$ " long; oval; a flat, thin wing around the seed; wing surface glabrous and margin entire; **no notch or slightly notched at tip; seed cavity distinct;** ripens in spring; perfect flowers.

Bark: Dark red-brown; nearly parallel furrows, not diamond-shaped; **without alternating light and dark layers (brown layers only);** inner bark slippery-wet and aromatic.

Wood: Heavy, hard, tough; similar to American elm.

General: Native to eastern Nebraska and the eastern U.S. Found naturally with mixed hardwoods. Inner bark was chewed by early woodsmen to quench thirst, or steeped in water as a remedy for fever. Intermediate shade tolerance.

Ulmus rubra



1. Winter twig, x $1\frac{1}{2}$.
2. Leaf, x $\frac{1}{2}$.
3. Flowering twig, x $\frac{3}{4}$.
4. Fruit, samara, x 1.



ree Identification Key

A **dichotomous key**, or two-branched key, helps with tree identification by sequentially comparing sets of tree characteristics to narrow the choices down to one tree species.

This tree identification key includes the 60 species described in this manual. To use this key, start on the line with the lowest letter or number. There are always two lines with the same letter or number to choose from. First, read the descriptions on those two lines. Decide which description best fits the tree. Then go to the next letter or number listed below the description you chose. Again, choose between two descriptions with the same letter or number. At each step you only need to make one or two fairly simple decisions. Keep going until you reach the common name of the tree. Then review the species description for that tree to confirm a match.

For example, let's say you have a large tree with simple, opposite, broad, palmately-lobed leaves, a winged fruit, and twigs with a strong smell when crushed. First go to the letter choices at the beginning of the key. Your choices will lead you to Key 2 for simple, opposite, broad leaves. In Key 2, the first choice (1) is "leaves palmately lobed and, fruit a samara" versus "leaves not lobed." Your leaves are lobed and your fruit is a samara, which leads you to number 2, "leaves with sharply and often doubly toothed margins and sharp-angled sinuses" or "lobes of leaves entire or with a few blunt teeth and more rounded sinuses." Again take the first choice. Now go to 3, "leaves with middle lobe much longer than side lobes; shrub or small tree when mature" versus "leaves with middle lobe equal to, or only slightly longer than, side lobes; full-sized trees when mature." Your leaves don't have a middle lobe that is much longer than the side lobes, and your tree is full-sized, so you take the second choice and go on to 4 (your tree is not an Amur maple). Under 4 you notice that only one choice mentions a strong smell for crushed twigs. You have identified your tree as a silver maple.

This key does not include every tree found in Nebraska. It is easy to make a mistake if you make the wrong decision using the key or if your sample is not typical of the species. Remember to check your identification with the species descriptions or with other references found in a library or bookstore. Several other references are listed on this page.

This key works best in summer with leaves on, but may work in other seasons if you can find old leaves and/or fruit on the ground, and if you use leaf scars as signs of leaf arrangement.

Bagley, Walter T., and Richard K. Sutton. 2007. *Wood Plants for the Central and Northoern Plains*. The Blackburn Press, Caldwell, NJ. 604 pp.

Dirr, Michael A. 1990. *Manual of woody landscape plants: their identification, characteristics, culture, propagation and uses*. Fourth Edition. Stipes Publ. Co., Champaign, IL 1007 pp.

Elias, T.S. 1980. *The complete guide to North American trees*. Von Nostrand Reinhold Co., NY. 948 pp.

Harlow, William H. 1941. *Fruit key and twig key to trees and shrubs*. Dover Publ., Inc., NY. 56 pp.

Little, Elbert L. 1980. *The Audubon Society Field LGuide to North American Trees - Eastern Region*. Alfred A. Knopf, Inc., New York, NY. 714 pp.

Muenschner, Walter C. 1950. *Keys to Woody Plants*. Comstock Publ., Inc., Ithaca, NY, 108 pp.

Preston, Richard J. 1989. *North American trees*. Iowa St. Univ. Press, Ames, IA. 407 pp.

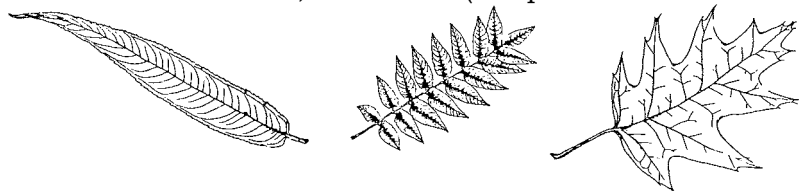
Preston, Richard J., and Valerie G. Wright. 1982. *Identification of southeastern trees in winter*. North Carolina Ag. Extension Service, Raleigh, NC. 113 pp.

SUMMER KEY TO NEBRASKA TREES

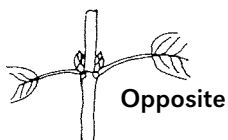
A. Leaves needle-like, scale-like, or awl-shaped; usually evergreen..... **Key 1** p. 48



A. Leaves broad and thin; deciduous (not persistent over winter).



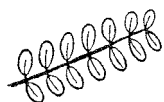
B. Leaves opposite or whorled (in 3's) on twig.



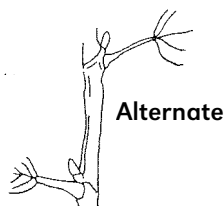
C. Leaves simple **Key 2** p. 49



C. Leaves compound **Key 3** p. 49



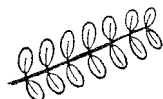
B. Leaves alternate on twig.



D. Leaves simple..... **Key 4** p. 50



D. Leaves compound **Key 5** p. 52



Key 1. Trees with needle-like, scale-like, or awl-shaped leaves. (Gymnosperms except ginkgo)

1. Leaves needle-like; fruit a cone.
 2. Needles occur in clusters of 2-5 (**pin**es).
 3. Needles in clusters of 5; cones cylindrical, their scales thin (**soft** or **white pin**es).
 4. Needles 1½" to 3" long, stout, rigid; young branches flexible; usually found only in western Nebraska **limber pine** p. 19
 4. Needles 3" to 5" long, flexible, slender; usually found in eastern Nebraska **eastern white pine** p. 21
 3. Needles occur in clusters of 2-3, cone scales thick (**hard pin**es).
 5. Needles 2 and 3 in a cluster, 5" to 10" long; cone scales armed with spines; buds red **ponderosa pine**, p. 20
 5. Needles 2 in a cluster, usually 6" long or less.
 6. Needles 4" to 6" long, stout, stiff, bark of trunk gray-brown with black furrows; buds silvery **Austrian pine** p. 20
 6. Needles ¾" to 4" long.
 7. Needles ¾" to 1½" long, yellow-green, widely spread in cluster; cones often remain closed and stay on the branch for many years **Jack pine** p. 19
 7. Needles 1½" to 4" long, blue-green to yellow-green, twisted; bark on upper trunk orange-red **Scotch pine** p. 19
 2. Needles occur singly.
 8. Finest twigs very slender, greenish, mostly deciduous; needles yellow-green, flattened, two-ranked, deciduous; cones ¾" to 1" diameter, round, with several woody scales; bark fibrous; base of trunk often flared **baldcypress** p. 22
 8. Needles and twigs not deciduous; needles not yellow-green; bark not fibrous.
 9. Needles flat in cross section; tips rounded or occasionally pointed.
 10. Needles stalked, ¾" to 1¼" long; small branches roughened by old needle bases; cones 3" to 4" long, hang down, with 3-pointed, fork-like bract protruding from each scale **Douglas-fir** p. 21
 10. Needles not stalked, 2" to 3" long; small branches smooth; cones upright with deciduous scales **concolor fir** p. 16
 9. Needles 4-sided, square or diamond-shaped in cross section, tips sharply pointed (**spruces**)
 11. Needles dark green or yellow-green, tips sharp-pointed; slight odor when crushed; cones 4" to 8" long, scales stiff; branches droop on older trees **Norway spruce** p. 18
 11. Needles blue-green to silver-white; tips very sharp-pointed; pungent odor when crushed; cones 2" to 4" long, scales thin and papery; branches do not droop **blue spruce** p. 18
 1. Leaves scale-like or awl-shaped, often both on same tree; fruit berry-like (**junipers**).
 12. Leaves dark green to purple-green; fruit small, berry-like, pale green to dark blue, matures in one season; native to eastern two-thirds of Nebraska. **eastern redcedar** p. 17
 12. Leaves green to light blue-green; fruit as above, but maturing in two seasons; native to western one-third of Nebraska. **Rocky Mountain juniper** p. 17

Key 2. Trees with opposite or whorled, simple (not compound), broad leaves.

1. Leaves palmately lobed; fruit a samara (**maples**).
 2. Leaves silvery-white on lower surface.
 3. Buds pointed, not reddish; leaves about 5" across, 5-lobed **sugar maple** p. 25
 3. Buds blunt, reddish.
 4. Leaves usually 4" across or less, mostly 3-lobed; samara about ¾" long; twigs with no strong smell when bruised; not native to Nebraska. **red maple** p. 24
 4. Leaves usually 6" to 7" across, mostly 5-lobed; samara about 1½" long; twigs with strong smell when bruised; native to Nebraska. **silver maple** p. 25
 2. Leaves not silver-white on lower surface.
 5. Sap from broken petioles milky (may not show if very dry); buds green or red, stout and blunt **Norway maple** p. 24
 5. Sap from broken petioles not milky; buds brown, slender and pointed **sugar maple** p. 25
1. Leaves not lobed.
 6. Leaves 8" to 15" long, with long tapering tip, heart-shaped, usually in whorls of 3; fruit a slender capsule, 8" to 20" long **northern catalpa** p. 29
 6. Leaves less than 8" long, not heart-shaped, veins parallel to the leaf margin..... **flowering dogwood** p. 31

Key 3. Trees with opposite, compound leaves.

1. Leaves palmately compound; fruit a 3-part capsule with shiny, brown, nut-like seeds.
 2. Leaflets usually 7; buds gummy. **horsechestnut** p. 26
 2. Leaflets usually 5; buds not gummy; injured twigs with strong, unpleasant odor. **Ohio buckeye** p. 26
1. Leaves pinnately compound; fruit a winged samara.
 3. Leaflets mostly 3 to 5; fruit a 2-winged samara; twigs green **boxelder** p. 23
 3. Leaflets mostly 5 to 9, fruit a 1-winged samara; twigs not green (**ashes**).
 4. Upper edge of leaf scars deeply notched under lateral bud; twigs glabrous and glossy; purple fall leaf color; uncommon **white ash** p. 32
 4. Upper edge of leaf scars curved or straight across under lateral bud; twigs velvety near tip; common **green ash** p. 32

Key 4. Trees with alternate, simple leaves. (Sometimes leaves are clustered on short spurs.)

1. Leaves lobed.
 2. Leaves fan-shaped with parallel-branched veins running to edge, mostly on short, spur-like branches, 2 blunt lobes on outer end of leaf, formed by a notch in the leaf margin **ginkgo** p. 16
 2. Leaves and veins not as above.
 3. Leaves distinctly palmately lobed and veined.
 4. Petiole base hollow and covering lateral bud; mature leaves hairy only along veins underneath, 4" to 9" wide (sometimes wider); bark on trunk and branches rough, smooth, or peeling off in large plates all on the same tree; fruit a dry ball of hairy achenes, hanging on a long stalk **American sycamore** p. 37
 4. Petiole base not hollow and not covering lateral bud; mature leaves dark green above, covered with fine white hairs underneath, less than 4" wide, some leaves not lobed; bark of upper or younger trunk and branches smooth and white or gray-green, breaking into black ridges when older; fruit a small capsule releasing cottony seeds **white poplar** p. 37
 3. Leaves pinnately lobed or at least not distinctly palmately lobed.
 5. Leaves with 3 main veins from near the base, with 1 to several lobes (some not lobed); composite fruit of small, fleshy drupes, red to dark purple. **red mulberry** p. 36
 5. Leaves with 1 large main vein (midrib), lobed in various ways; fruit not as above.
 6. Leaves oddly lobed, 4 lobes, leaf wide and flat across the base and tip, flower very large and showy; terminal bud solitary, ½" long with 2 scales, resembles a duck's bill. **yellow-poplar** p. 34
 6. Leaves pinnately lobed, not flat across the tip; flowers not showy; several terminal buds clustered at branch tips, buds with many scales; fruit an acorn (**oaks**)
 7. Lobes of leaves blunt or rounded, not bristle tipped; acorn matures in 1 season, inner shell surface of acorn nut not hairy (**white oaks**).
 8. Leaves hairy on lower surface, usually lobed below the middle and coarsely toothed above; edge of acorn cap bristly; bark on twigs often in corky ridges..... **bur oak** p. 40
 8. Leaves not hairy on lower surface, fairly evenly lobed over entire length; edge of acorn cap warty; bark on twigs not in corky ridges..... **white oak** p. 39
 7. Lobes of leaves sharp, bristle tipped; acorn mature the second season, inner surface of nut shell hairy (**red oaks**).
 9. Leaves 7 to 11 lobed, openings between lobes extending half way or less to midrib, leaf surfaces smooth except for small tufts of hair where veins join on lower side, upper surface dull to slightly glossy and dark green; acorns ¾" to 1¼" long. **northern red oak** p. 41
 9. Leaves 5 to 7 lobed, openings between lobes extending more than halfway to midrib; acorns ½" to ¾" long.
 10. Openings between lobes of leaves extend about 2/3 of the way to midrib, leaf surfaces smooth except sometimes scaly and yellowish to copper-colored below, upper surface very glossy and very dark green; acorns ½" to ¾" long..... **black oak** p. 42
 10. Openings between lobes of leaves very deep, leaves generally bright green and shiny above, paler below and smooth except for tufts of hair where veins join; acorns about ½" long, often striped..... **pin oak** p. 41
 1. Leaves not lobed.
 11. Leaf margins entire (not toothed).
 12. Leaves and young twigs covered with silver or silver and brown scales; thorns often present; fruit drupe-like, yellowish, coated with silvery scales..... **Russian-olive** p. 31
 12. Leaves and twigs not covered with silvery scales.
 13. Leaves broadly heart-shaped, with 3 to 7 large veins radiating from the base; fruit a legume; small tree **eastern redbud** p. 30
 13. Leaves not heart-shaped; fruit not a legume.
 14. Leaves 4" to 5" long; twigs, fruit, and leaves with milky sap; spines or thorns often present on twigs; individed pith; fruit large, round, green, rough-textured **Osage-orange** p. 35
 14. Leaves 10" to 12" long; twigs, fruit, and leaves without milky sap; stems without spines; pith divided by woody plates fruit fleshy, sweet, green-yellow ripening to brown-black, 2" to 5" long; **pawpaw** p. 27

Key 4. Trees with alternate, simple leaves. (continued)

11. Leaf margins not entire (usually toothed).
 15. Sap milky; composite fruit of small, fleshy drupes, red to dark purple (resembles a blackberry); commonly has lobed leaves **red mulberry** p. 36
 15. Sap not milky; fruit not as above.
 16. Fruit small pods holding cottony seeds (**poplars**)
 17. Leaves white-hairy on lower surface, often lobed, coarsely toothed, petiole round in cross section **white poplar** p. 37
 17. Leaves not white-hairy on lower surface (when mature), finely or coarsely toothed, petiole flattened in cross section.
 18. Mature leaves 4" to 5" wide, triangular in outline, margin with fairly large, rounded teeth; very common along streams and lakes..... **eastern cottonwood** p. 38
 18. Mature leaves 1½" to 3" wide, round to oval in outline, edge finely toothed; uncommon in Nebraska. **quaking aspen** p. 38
 16. Fruit not as above, or if so, leaves narrow and long, petiole not flattened.
 19. Leaves with 3 to 5 nearly equal main veins from near the base.
 20. Leaves twice as long as wide, taper pointed, with uneven bases; pith finely chambered; bark of trunk with warts or corky ridges; fruit a purple drupe..... **hackberry** p. 30
 20. Leaves about as wide as long, heart-shaped; pith not chambered; bark of trunk without corky ridges; fruit several small nuts attached to a wing-like leaf **American basswood** p. 43
 19. Leaves with one main vein (midrib) from the base.
 21. Leaf base uneven; leaves 2-ranked, usually doubly toothed; fruit a samara (**elms**).
 22. Leaves very rough on upper surface, 5" to 7" long **slippery-elm** p. 45
 22. Leaves smooth or nearly so on upper surface.
 23. Mature leaves 4" to 6" long, coarsely double toothed. **American elm** p. 44
 23. Mature leaves 1" to 3" long, singly toothed or nearly so **Siberian elm** p. 44
 21. Leaf base not (or slightly) uneven.
 24. Each bud covered by a single, hood-like scale; leaves generally long and narrow **black willow** p. 43
 24. Each bud covered by 2 or more scales.
 25. Leaves coarsely, singly toothed; terminal buds clustered; fruit an acorn **chinkapin oak** p. 40
 25. Leaves not coarsely toothed, mostly finely or doubly toothed; fruit not an acorn.
 26. Leaf base broad, flat, or nearly so; fruit dry, cone-like or papery sac.
 27. Branches without short spurs; bark never peeling off in rolls, rough and platy; fruit a small nut enclosed in an inflated bag, several grouped together in a cone-like spike. **eastern hophornbeam** p. 36
 27. Branches with short spurs; bark on younger trees smooth or peeling off in rolls, horizontally-elongated corky ridges; fruit a samara in cone-like catkins (**birches**).
 28. Bark of trunk bronze to brown to salmon-pink (not white), papery **river birch** p. 27
 28. Bark of trunk white, papery..... **paper birch** p. 28
 26. Leaf base angled or tapering.
 29. Lower leaf surface waxy with a dense row of light brown hairs along each side of midrib near the leaf base; fruit a dark purple to black one-seeded drupe; bark on young stems smooth and dark with many horizontally-elongated ridges..... **black cherry** p. 39
 29. Midrib without hairs as above; fruit a multi-seeded pome; bark not ridged as above.
 30. Pome red to green, one to several inches in diameter; bud and twig woolly..... **apple** p. 35
 30. Pome dark red to purple, ½" or less in diameter; bud and twig smooth or only slightly hairy..... **downy serviceberry** p. 27

Key 5. Trees with alternate, compound leaves.

1. Leaves bi- or tri-pinnately compound (some once-compound).
 2. Leaflets 2" to 3" long, margins not toothed; fruit a 4" to 6" long, brown legume, 1½" to 2" wide, with a few large, hard seeds; no thorns **Kentucky coffeetree** p. 33
 2. Leaflets usually 1" long or less, margins finely toothed, some leaves once-compound; fruit a 12" to 18" long, brown legume, about 1" wide, with many small, hard seeds; stout thorns often present, especially on native trees **honeylocust** p. 33
1. Leaves once compound.
 3. Lateral buds hidden (base of rachis hollow, forming a hook-like covering over the lateral buds); fruit a legume; spines or prickles usually present on twigs **black locust** p. 42
 3. Lateral buds exposed; fruit not a legume; no spine or prickles on stem.
 4. Leaves 1' to 4' long, 11 to 41 leaflets; have a strong, musty, disagreeable odor when crushed; twigs very stout, pith solid, wide, light brown; fruit a samara..... **tree-of-heaven** p. 26
 4. Crushed leaves without a musty, disagreeable odor; pith solid or chambered; fruit a nut.
 5. Leaflet margins finely toothed; fruit a round nut; pith usually chambered, light brown, husk of nut does not split along lines when ripe **black walnut** p. 34
 5. Pith solid; husk of nut splits along lines when ripe.
 6. Leaflets mostly 5 to 7; nut shell thick; terminal buds large, brown..... **shagbark hickory** p. 29
 6. Leaflets mostly 7 to 9; nut shell thin; terminal buds sulfur-yellow **bitternut hickory** p. 28



Glossary

Achene: small, dry, hard one-seeded fruit.

Acorn: nut-like fruit of an oak with a scaly or warty cap.

Alternate leaves: leaves arranged singly on alternating sides of the twig.

Angiosperm: class of plants that has the seeds enclosed in an ovary; includes flowering plants.

Annual rings: a layer of wood including spring-wood and summer-wood grown in a single season; best seen in the cross section of the trunk.

Awl-like leaves: short leaves that taper evenly to a point; found on junipers and redcedars.

Berry: fleshy fruit with several seeds.

Bisexual flower: a perfect flower; a flower with organs of both sexes present.

Broadleaf: trees having broad, flat-bladed leaves rather than needles; also a common name for hardwoods.

Cambium: growing layer of tissue, one to several cells wide, between the bark and the wood; divides to form new wood and bark.

Capsule: dry fruit that splits open, usually along several lines, to reveal many seeds inside.

Chambered pith: pith divided into many empty horizontal chambers by cross partitions.

Common name: familiar name for a tree; can be very misleading because common names vary according to local custom. There may be many common names for one species.

Compound leaves: leaves with more than one leaflet attached to a stalk called a rachis.

Conifer: trees and shrubs that usually bear their seeds in cones and are usually evergreen; includes pines, firs, spruces, yews, and Douglas-fir.

Cross section: surface or section of tree shown when wood is cut at right angles to the grain; shows the circular growth rings. Same as transverse section.

Deciduous leaves: leaves that die and fall off of the tree after one growing season.

Dichotomous key: a key to tree identification based on a series of decisions, each involving a choice between two identification characteristics.

Diffuse-porous: a type of hardwood in which vessels in the spring-wood are the same size as vessels in summer-wood (e.g. maples, birches, poplars, etc.).

Dioecious: having unisexual flowers with staminate (male) and pistillate (female) flowers borne on different trees.

Drupe: fleshy fruit with a single stone or pit.

Elliptic: resembling an ellipse and about one-half as wide as long.

Entire margin: leaf margins that are smooth (not toothed).

Evergreen: trees and shrubs that retain their live, green leaves during the winter and for two or more growing seasons.

Family: group of closely related species and genera; scientific name ends in “aceae.”

Forest ecology: study of the occurrence of forest plants and animals in respect to their environment.

Genus: a group of species that are similar; the plural of genus is genera.

Glabrous: smooth, with no hair or scales.

Glaucous: covered with a grayish or bluish waxy or powdery substances, e.g. the “bloom” on fruits.

Gymnosperm: large class of plants having seeds without an ovary, usually on scales of a cone; includes conifers and ginkgo.

Hardwoods: usually refers to trees that have broad-leaves and wood made up of vessels; similar to angiosperms.

Heartwood: nonliving wood (often dark) found in the middle of a tree's stem.

Imperfect flower: a unisexual flower with either functional stamens or pistils, but not both.

Inflorescence: the flowering portion of a plant.

Lanceolate: lance-shaped; about 4 times as long as wide and widest below the middle.

Lateral bud: bud found along the length of the twig (not at the tip); occur where the previous year's leaves were attached.

Leaflet: small blade of a compound leaf attached to a stalk (rachis); without a bud where attached.

Legume: fruit that is a dry, elongated pod that splits in two, with seeds attached along one edge inside.

Lobed margin: leaf margin with gaps that extend more or less to the center of the leaf.

Lustrous: glossy, shiny.

Monoecious: having unisexual flowers with staminate (male) and pistillate (female) flowers borne on the same tree, though often on different branches.

Multiple fruit: fruit made up of a cluster of ripened ovaries that came from many separate flowers attached to a common receptacle. Also called a "composite fruit."

Naturalized: thoroughly established, but originally from a foreign area.

Needle-like leaves: very thin, sharp, pointed, pin-like leaves found on pines, firs, and some other softwoods.

Node: the point on a stem where leaves and buds are attached.

Nut: hard, dry fruit with a woody or papery wall that does not split easily, encased in an outer husk.

Obovate: inversely ovate.

Opposite leaves: leaves arranged directly across from each other on the twig.

Orbicular: circular in outline.

Oval: broadly elliptic, with the width greater than one-half the length.

Ovate: having the lengthwise outline of an egg, widest below the middle.

Palmately compound: compound leaves in which several leaflets radiate from the end of a stalk (rachis); like the fingers around the palm of a hand.

Perfect flower: a bisexual flower with functional stamens and pistils.

Persistent leaves: leaves that remain on the tree during winter.

Petiole: a slender stalk that supports a simple leaf.

Phloem: inner bark of a tree that carries food and sugars from the leaves to other parts of the tree.

Photosynthesis: process through which the leaves, with energy from sunlight, make food from water and carbon dioxide.

Pinnately compound: compound leaves in which leaflets are attached laterally along the rachis or stalk; leaves may be once, twice, or three times pinnately compound.

Pistil: the ovary-bearing (female) organ of a flower.

Pistillate flower: a unisexual (female) flower bearing only pistils.

Pith: tissue found in the middle of a stem or branch.

Polygamo-dioecious: having unisexual flowers with staminate (male) and pistillate (female) flowers borne on different trees, but also having some perfect flowers on each tree.

Polygamo-monoecious: having unisexual flowers with staminate (male) and pistillate (female) flowers borne on the same tree, along with some perfect flowers on each tree.

Polygamous: Having some unisexual flowers and some bisexual flowers on each plant (can be polygamo-monoecious or polygamo-dioecious).

Pome: fruit with a fleshy outer coat surrounding a papery, walled inner chamber containing several seeds (e.g. apples).

Pubescent: covered with hairs.

Rachis: the central stalk to which leaflets of a compound leaf are attached.

Radial-section: surface or section of a tree shown when wood is cut down its length straight through the middle.

Rays: ribbon-like groups of vessels, tracheids, and fibers that move water and other substances in the xylem between the inner and outer rings and the phloem; best seen in radial sections of the trunk.

Rhombic: with an outline resembling a rhombus (diamond-shaped).

Ring-porous: type of hardwood in which the vessels in spring-wood are much larger than vessels in summer-wood (e.g. oaks, ashes, and elms).

Samara: dry fruit with one or two flat wings attached to a seed (e.g. elms and maples).

Sapwood: living wood, often light colored, found between the cambium and the usually darker colored heartwood.

Scale-like leaves: small, short, fish-scale-like leaves that cover the entire twig; found on juniper and redcedar.

Scientific name: Latin-based name used world-wide to standardize names of trees and other plants and animals.

Semi-ring-porous: type of hardwood in which the vessels in the spring-wood are somewhat larger than vessels in summer-wood; (e.g. black cherry and black walnut).

Serrate: having sharp teeth pointing toward the tip.

Shade intolerant: not capable of prospering under shaded conditions.

Shade tolerant: capable of enduring shaded conditions.

Shrub: low-growing woody plant with many stems rather than one trunk.

Simple leaves: leaves with one blade attached to a petiole, or stalk.

Sinus: a recess between two lobes.

Softwoods: trees that are conifers or cone-bearing; generally have softer wood than angiosperms or hardwoods, but with many exceptions.

Species: trees with similar characteristics and that are closely related to each other; species is used in both the singular and plural sense (specie is not proper).

Spring-wood: wood on the inside of an annual ring, formed during the spring; cells are often larger and thinner-walled.

Stamen: the pollen-bearing (male) organ of a flower.

Staminate flower: a unisexual (male) flower bearing only stamens.

Strobile: a cone or inflorescence with overlapping bracts or scales.

Summer-wood: wood on the outside of an annual ring, formed during the summer; cells are often thicker-walled and sometimes darker.

Tangential-section: surface or section of a tree shown by cutting a tree lengthwise, but not through the middle.

Terminal bud: bud appearing at the apex, or end, of a twig, usually larger than lateral buds.

Toothed margin: leaf margin with coarse, fine, sharp, or blunt teeth.

Tracheids: small-diameter cellular tubes in the wood of softwood, or gymnosperm, trees that carry water from the roots to the leaves.

Tree: a woody plant; unbranched at or near the base; usually over 10 feet tall and 2 inches in diameter.

Twig: a woody plant shoot of the current season.

Tyloses: bubble-like structures that sometimes develop and block wood vessels.

Unisexual flower: an imperfect flower; a flower with organs of only one sex present.

Vessels: large-diameter cellular tubes in the wood of hardwood, or angiosperm, trees that carry water from the roots to the leaves.

Xylem: the wood of a tree; made up of strong cellular fibers, tracheids, and vessels.



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