

TITLE: TREES OF NORTH AMERICA: The Angiosperms--Part II
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OPERATING INSTRUCTIONS: Begin this program with slide "1" on the screen and the tape advanced through the clear leader.

The following slides are in vertical format and should be checked to see that they're properly oriented in your tray: 15, 18, 38, 48.

NOTE: Genera within the following families are included in this slide-tape: Walnut--Juglandaceae; Elm--Ulmaceae; Magnolia--Magnoliaceae; Sycamore--Platanaceae; and Rose--Rosaceae.

SLIDE 1: series title

In this slide-tape we'll continue our look at the principal angiosperms of North America. Again, angiosperms are more commonly, but less accurately, referred to as hardwoods or broadleaves.

SLIDE 2: family title

The next family we'll look at is Walnut, Juglandaceae. Like the families in the previous slide-tape, all members of the Walnut family bear their flowers in aments. The Walnut family consists of approximately 5 genera and 50 species in the temperate and tropical regions of the New World. Two of these genera contain important trees in North America.

SLIDE 3: genus title

The first of these is walnut, *Juglans*.

SLIDE 4: map--worldwide distribution of genus

Approximately 20 species of walnut are distributed throughout the temperate and tropical regions of the world, although most occur in the Northern Hemisphere. Six species are native to North America.

SLIDE 5: green nut (*Juglans* spp.)

Walnuts are most easily identified by their fruits. On the outside is a smooth, leathery outer cover that's green early in its development, but turns black and soft as it ripens. In both stages it has a very pungent odor associated with it. It's important to note that this outer covering does not split open cleanly, but gradually falls apart with age.

SLIDE 6: nut (*J. nigra*)

On the inside is a second covering. This one is about the size and hardness of a golf ball. Unlike the outer covering, however, this inner shell is deeply wrinkled and has a distinct, raised suture running around it. In spite of this suture, walnuts are often very hard to crack--in fact, black walnut shells are so tough they were once added to asphalt and rubber tires to keep them from wearing out! Inside this inner shell is the highly wrinkled, distinctively flavored nut that we all know as the commercial walnut.

SLIDE 7: twig with chambered pith (*J. nigra*)

Twigs are also good clues to identifying walnuts because they're very stout and have characteristic leaf scars, buds, and aroma. Perhaps most importantly, they have chambered piths, as you can see on the twig that's sliced open.

SLIDE 8: flowers (*Juglans* spp.)

The flowers of walnuts are also distinctive, although they're by no means showy. They occur in long, unbranched aments. The fact that they're unbranched makes walnuts easy to distinguish from their close relatives the hickories, which have aments that normally occur in sets of three, like long, floppy pitchforks.

SLIDE 9: leaves (*J. nigra*)

The leaves of walnuts are deciduous, alternate, and pinnately compound with 9-23 leaflets. The leaflets are lanceolate, have long, tapering tips, asymmetrical bases, and short to non-existent petioles. Like the fruit and twigs, the leaves have a highly pungent odor, derived from the chemical juglone. This chemical is quite toxic to other plants and helps insure that none grow too closely to the base of the walnut tree.

SLIDE 10: tree (*J. nigra*)/list

Walnuts are among the most highly prized trees in the world for lumber and veneer, having deep, rich, highly patterned grains. Several species are also important for nut production.

SLIDE 11: map--distribution of principal species in North America

Black walnut, *Juglans nigra*, and butternut, *Juglans cinerea*, are the two principal walnuts native to North America. Each grows throughout the eastern United States, with butternut occurring farther north, and black walnut farther south.

SLIDE 12: genus title

The second genus in the Walnut family that we'll look at is hickory, *Carya*. The hickories are much like the walnuts just described, so try to focus on the differences.

SLIDE 13: map--worldwide distribution of genus

There are about 17 species of hickory, largely confined to North America and China. Thirteen species occur in the eastern half of North America alone.

SLIDE 14: fruit (various *Carya* spp.)

Hickories are perhaps most easily recognized by their fruits, which are round nuts with hard or semi-hard inner shells. In contrast to the walnuts, hickory shells are smooth or only slightly wrinkled. This inner shell is enclosed by a tough leathery outer husk much like that of the walnuts. In hickories, however, this outer husk is dehiscent, so that at maturity it breaks into pieces that fall cleanly away from the shell.

SLIDE 15: flowers (*C. tomentosa*)

Like the flowers of walnuts, the flowers of hickories are borne in long aments. However, while walnut aments are unbranched, hickory aments occur in sets of three.

SLIDE 16: leaves (*Carya* spp.)

The leaves of hickories are also much like those of the walnuts. Hickory leaves are alternate, deciduous, and pinnately compound with 3-17 leaflets, although 5-9 seems most common. Individual leaflets are generally ovate, with finely serrate margins, tapered tips, and slightly asymmetrical bases. When compared with walnuts, hickory leaves normally have fewer leaflets per compound leaf, and hickory leaflets tend to be rounder.

SLIDE 17: twig (*Carya* spp.)

The twigs of the hickories are stout and have conspicuous leaf scars--like the walnuts--but unlike the walnuts, hickories do not have chambered piths.

SLIDE 18: shaggy bark (*C. ovata*)

Bark can often help identify the hickories, because many species have shaggy bark that exfoliates in long strips or slabs.

SLIDE 19: tree (*Carya* spp.)/list split

Hickories are large, fast-growing trees that often reach 100' in height and several feet in diameter. They produce strong, shock-resistant wood that's highly prized for baseball bats, oars and paddles, and tool handles for axes, shovels, and the like. A subgroup of hickories, known as the pecan hickories, are also prized for their edible nuts and fine furniture veneer.

SLIDE 20: map--distribution of principal species in North America

There are a number of important hickories growing in the eastern half of North America. Some are confined to bottomlands and river valleys while others grow across a wide spectrum of sites and are especially common on poor, dry sites. Shagbark hickory, *Carya ovata*, shellbark hickory, *Carya laciniosa* and mockernut hickory, *Carya tomentosa*, are the principal species in the subgroup called the "true hickories". Pecan, *Carya illinoensis*, and bitternut hickory, *Carya cordiformis*, are two of the principal "pecan" hickories, cultivated for their edible nuts .

SLIDE 21: family title

That finishes our look at families whose flowers are borne in aments. The next family we'll look at is Elm, Ulmaceae, which bears its flowers in small clusters. A unique feature of this family is that its flowers don't have petals. There are approximately 15 genera and 200 species of elm scattered throughout the temperate and subtropical regions of the world. Two of these genera contain tree-sized members in North America.

SLIDE 22: genus title

The first, and most important, of these genera is elm, *Ulmus*.

SLIDE 23: map--worldwide distribution of genus

Approximately 20 species of elm are distributed throughout the Northern Hemisphere, primarily, but not exclusively in the temperate regions. About six species are native to North America.

SLIDE 24: fruit (single/cluster split) (*U. americana*)

Perhaps the single most distinctive characteristic of the elms is their fruit, which are round, flat, fuzzy samaras. These samaras are typically borne in numerous, dense clusters that develop very early in the year, just before the leaves begin to unfold. In fact, these green samaras probably photosynthesize enough to partially support leaf production. The samaras are so prevalent that once they fall they often completely cover the ground under each tree.

SLIDE 25: leaves (*U. americana*)

The leaves of elms are simple, alternate, and deciduous, and would normally fit in the palm of your hand. Perhaps most importantly, they're doubly serrate and have prominently asymmetrical bases, as you can readily see in the slide.

SLIDE 26: tree (*U. americana*)

The twigs of most elms are slender and droopy, which often results in this characteristic, vase-like appearance, which make open-grown elms easy to identify even at great distances.

SLIDE 27: bark (*U. americana*)/list

The wood of elms is highly prized as lumber and veneer. The tough, stringy bark was used by native cultures for making ropes and coarse cloth. Horticulturally, elms are one of the most important groups of shade trees in the world, although they're seldom planted for that purpose anymore due to the prevalence of Dutch elm disease, which claims the life of virtually any elm tree in its path.

SLIDE 28: map--distribution of principal species in North America

The two principal elms found in North America are American elm, *Ulmus americana*, and red elm, *Ulmus rubra*. Although American elm has the wider distribution, both range widely across the eastern half of the United States, growing especially well along streams and in moist bottomlands.

SLIDE 29: genus title

The second genus that we'll look at in the Elm family is hackberry, *Celtis*. Like the elms, hackberries have flowers without petals.

SLIDE 30: map--worldwide distribution of genus

The hackberry genus contains approximately 75 species scattered throughout the temperate and tropical regions of the world. Of these 75, only about five reach tree-size in North America.

SLIDE 31: fruit (*C. occidentalis*)

The most readily identifiable characteristic of the hackberries is their fruit, which is a small, thin-fleshed but thick-skinned drupe. The pit of the drupe is marked with a distinctive net-like pattern.

SLIDE 32: leaves (*Celtis* spp.)

The leaves of the hackberries are generally deciduous, but in some tropical species may be evergreen. All species have simple, alternate leaves, and most have margins that are singly serrate.

SLIDE 33: tree (*Celtis* spp.)

Hackberries are generally small to medium sized trees that grow intermixed with other species. Their wood is of little commercial importance, but certain species make good shade and ornamental trees.

SLIDE 34: map--distribution of principal species in North America

Two species are relatively common to the eastern United States although neither is especially important. Common hackberry (*Celtis occidentalis*) is widespread east of the Rocky Mountains, while sugar hackberry, or sugarberry as it's more commonly called (*Celtis laevigata*) grows throughout the southeastern states.

SLIDE 35: family title

The next set of families we'll focus on is distinguished by the fact that their petals are all separate and free from each other. It represents the largest group of families in North America. The first family in this group is Magnolia, Magnoliaceae. The Magnolia family contains approximately 12 genera and 230 species, widely scattered throughout the temperate regions of the Northern Hemisphere. Only two genera are native to North America, magnolia and yellow-poplar.

SLIDE 36: genus title

The first genus in the Magnolia family that we'll look at has an easy name to remember. Its common name is magnolia, and its scientific name is *Magnolia*.

SLIDE 37: map--worldwide distribution of genus

The *Magnolia* genus contains approximately 80 species distributed throughout the warm temperature and tropical regions of the Americas, and most of Southeast Asia and China. Of these 80 species, only 8 are native to North America.

SLIDE 38 tree (*M. grandiflora*)

Although one or two species are commercially important for lumber production...

SLIDE 39: small tree in flower (*Magnolia x soulangiana*)

...magnolias are more highly prized for ornamental uses because of their showy flowers .

SLIDE 40: flower (*M. grandiflora*)

Flowers are one of the best ways of identifying magnolias, both from other genera, and between members within the magnolia genus. Although the colors may vary...

SLIDE 41: flower (*M. x soulangiana*)

...the petals are always large, showy, and shaped like a cup or vase. The petals are normally soft and velvety. It's important to note that in many species the flowers bloom well before the leaves appear in Spring.

SLIDE 42: leaves (*M. grandiflora*)

Magnolia leaves are simple, alternate, and unlobed. They may be lanceolate, elliptical, or ovate, but are always several times longer than they are broad. They may be deciduous or persistent, depending on the species.

SLIDE 43: bud (*M. grandiflora*)

Magnolias are often easily identified by their twigs, which are moderately stout and are capped by a large terminal bud covered by a single, cap-like scale that's often covered with dense hairs.

SLIDE 44: fruit (*M. grandiflora*)

Magnolias are also easily recognized by their unique fruits—leathery, cone-like aggregates containing bright red seeds. When ripe, these seeds drop from the fruit and hang by slender white threads. Because the seeds are unwinged, this strategy greatly aids in their dispersal by birds, who can easily pick the hanging seeds directly from the fruit.

SLIDE 45: map--distribution of principal species in North America

Only two native magnolias are commercially important in North America, but many others are widely planted as ornamentals. Cucumber magnolia, *Magnolia accuminata*, occupies the center of the eastern half of the United States, and southern magnolia, *Magnolia grandiflora*, occupies the southeastern coastal plains.

SLIDE 46: genus title

The other genus that we're going to look at in the Magnolia family is yellow-poplar, *Liriodendron*. Notice that the name yellow-poplar is hyphenated, indicating that this genus is not related to the true poplars like the cottonwoods, aspens, and willows. Also notice that several other common names are frequently used in addition to yellow-poplar.

SLIDE 47: map--worldwide distribution of genus

The yellow-poplar genus is a small one, containing only two species--one growing throughout eastern North America, and the other in central China.

SLIDE 48: tree (*L. tulipifera*)

Both species are large, fast-growing trees that are highly prized for their lumber. In natural situations they grow tall and straight, often reaching 200 feet in height.

SLIDE 49: tree (*L. tulipifera*)

They are also highly prized as shade and ornamental trees, because of their dense crowns and beautiful flowers.

SLIDE 50: leaves and flowers (*L. tulipifera*)

The flowers, fruit, and leaves of yellow-poplars are all easy to recognize.

SLIDE 51: leaves (*L. tulipifera*)

The leaves are large, deciduous, lobed, and alternate. Most importantly, their apexes are shallowly notched, giving the appearance of being cut off with a scissors.

SLIDE 52: flower (*L. tulipifera*)

The flowers are distinctly tulip-like, a fact which gives rise to the common name "tulip tree". They're cup-shaped, and are borne upright on the ends of short branches. Each flower has three light-green sepals surrounding six orange-tinged petals. The stamens are long, numerous, and bright yellow. The flowers normally appear in May or June, well after the tree has leafed-out.

SLIDE 53: fruits (*L. tulipifera*)

The fruits are single-winged samaras that are borne in erect, cone-like aggregates.

SLIDE 54: tree in winter with fruit (*L. tulipifera*)

Most of the time the samaras persist well into winter, making the yellow-poplar easy to identify even once the leaves are long-gone.

SLIDE 55: map--distribution of principal species in North America

Only one yellow-poplar is important in North America, and it goes by the generic name yellow-poplar. Its scientific name has a lyrical ring to it, *Liriodendron tulipifera*.

SLIDE 56: family title

The next family we'll look at is Sycamore, *Platanaceae*. There's only one genus of sycamore in the world and about 10 species, three of which are native to North America.

SLIDE 57: genus title

Notice that two common names are listed for both the genus and family. Sycamore is the term preferred by North American foresters, while planetree is preferred by botanists and most foresters not from North America.

SLIDE 58: map--worldwide distribution of genus

There are approximately 10 species of sycamores throughout the world, three of which are native to North America. As you can see, sycamores grow primarily in warm, temperate regions, and in the tropics.

SLIDE 59: bark (*P. orientalis*)

The most readily identifiable characteristic of the sycamores is their green and white, or green and gray, exfoliating bark. In fact, sometimes it exfoliates to such an extent that there's a pile of bark at the base of each tree.

SLIDE 60: fruit/seed split (*P. orientalis*)

The fruits also uniquely identify sycamores. Each fruit is a round, golf-ball-sized head of tiny, tufted achenes. In some species each ball hangs singly, but in most they occur in strings of two, three, or four.

SLIDE 61: leaves (*P. occidentalis*)

The leaves of sycamores are also good identifying characteristics. They're large, (about twice the size of a human hand), simple, deciduous, and alternate. In most species they're deeply lobed, often giving the appearance of a very large maple leaf. Remember, however, that sycamore leaves are alternate, while maples are opposite. Among the sycamores the size and number of lobes can often be used to distinguish between different species.

SLIDE 62: tree (*P. occidentalis*)

Sycamores are large, fast-growing trees, often reaching 150 feet tall and 3-8 feet in diameter. They seem to grow best where there's an ample supply of water.

SLIDE 63: tree (*P. occidentalis*)/word

Although they have little commercial value for lumber, they're becoming increasingly important for pulpwood because of their fast growth rates. They're also quite important horticulturally because of their dense shade, striking appearance, and tolerance to air pollution.

SLIDE 64: map--distribution of principal species in North America

American sycamore, *Platanus occidentalis*, is the principal sycamore native to North America. It's most commonly found along streams and bottomlands throughout the eastern United States. However, London and oriental plane trees are the principal sycamores planted for shade throughout the world.

SLIDE 65: family title

The next family we'll look at is Rose, Rosaceae, a large and diverse family composed of some 120 genera and 3300 species of trees, shrubs, and herbs scattered throughout the world. From the standpoint of forestry, this family is relatively unimportant, but agriculturally and ornamentally, it's one of the most important families in the world. Although there are four or five tree-bearing genera in this family native to North America, only one is important in our forests.

SLIDE 66: genus title

As you can see, there are a variety of common names for this genus, due to the fact that each of the separate species is so well-known in its own right. Only the cherries, however, could be considered important forest trees.

SLIDE 67: map--worldwide distribution of genus

The genus *Prunus* includes some 150 species of trees and shrubs, most of which are distributed throughout the cool temperate regions of the Northern Hemisphere. Some, however, do extend into the temperate regions of the Southern Hemisphere. Twenty-five to thirty of these species are native to North America, although few of these reach tree size and only one is commercially important as a forest tree.

SLIDE 68: fruit (various *Prunus* spp.)

I doubt if any of you would have trouble identifying the fruit of a cherry, peach, plum, or apricot, or even guessing that they were closely related, since each has a hard "stone" surrounded by a fleshy outer covering.

SLIDE 69: almonds (*Prunus* spp.)

Almonds, however, might be another story, because all we normally see is the inner seed, or at most the seed plus its hard outer shell. This is analagous to seeing a peach pit and its seed. What we seldom see is the fleshy covering that grows over the almond, much like the fleshy fruit of a peach or apricot.

SLIDE 70: flowers (split) (*Prunus* spp.)

The flowers of *Prunus* are also distinctive. They're generally small, white or pink in color, and come in dense clusters, although some occur singly. Most have a single set of petals, but some ornamental varieties have multiple sets.

SLIDE 71: twigs (*Prunus* spp.)

The twigs of *Prunus* normally have heavy spur shoots which bear the majority of the flowers and fruits. In some species of Europe and Asia, these spur shoots have developed into thorns.

SLIDE 72: bark (*Prunus* spp.)

The bark of *Prunus* trees generally has prominent rows of lenticels, which break up an otherwise smooth bark. In some species the bark exfoliates, much like the birches we saw earlier. In all species, the bark contains measurable levels of the chemical cyanide, which, although not toxic, does impart a unique smell and bitter taste to the twigs and bark.

SLIDE 73: tree (*Prunus* spp.)/list

The genus *Prunus* is, of course, most important for its edible fruit. They're also very important ornamentally because of their beautiful flowers. Few species reach a size suitable for commercial harvest, but those that do are highly prized for their dark, rich-grained wood which is used primarily for furniture.

SLIDE 74: leaves (split) (*Prunus* spp.)

The leaves of *Prunus* are simple, alternate, and deciduous, although occasionally they're persistent. They're ovate to elliptical in shape and generally have serrate margins. Their petioles are short and almost always bear conspicuous glands either on the petioles or the leaf base. Stipules are common and often elaborate in design.

SLIDE 75: map--distribution of principal species in North America

Black cherry, *Prunus serotina*, is the only particularly important *Prunus* native to North America. It grows on deep, rich soils throughout the eastern half of the United States and scattered throughout the mountains of Mexico.

SLIDE 76: art

Other tree-bearing genera of the Rose family not described in this slide-tape are: serviceberry, Amelanchier, hawthorn, *Crataegus*, mountain-ash, *Sorbus*, and pear and apple, *Pyrus*. Although some of these genera contain important horticultural or ornamental species, none contain important forest trees. Descriptions for each of the genera may be found in any complete dendrology textbook.

SLIDE 77: Author Credit (no narration)

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