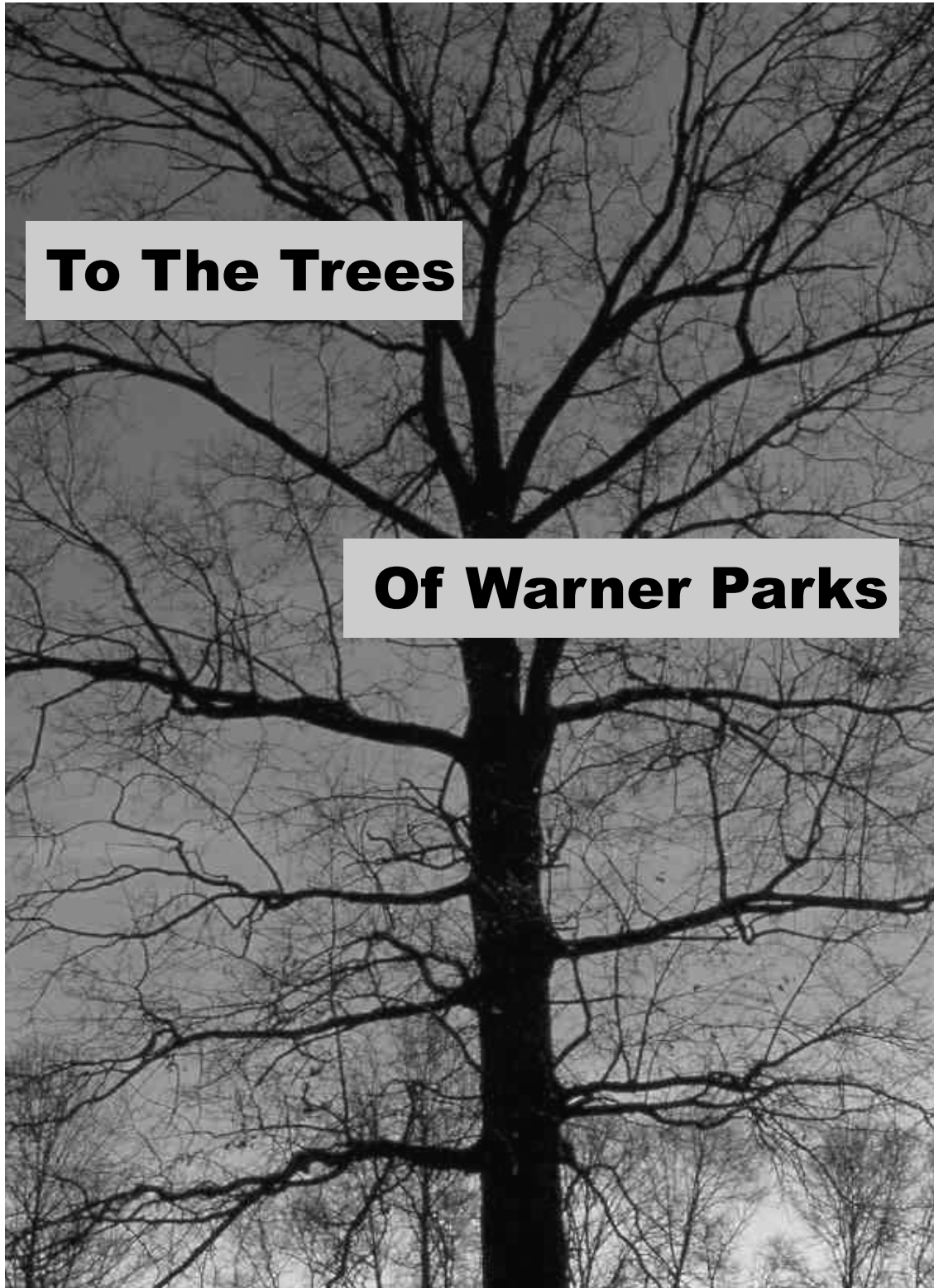


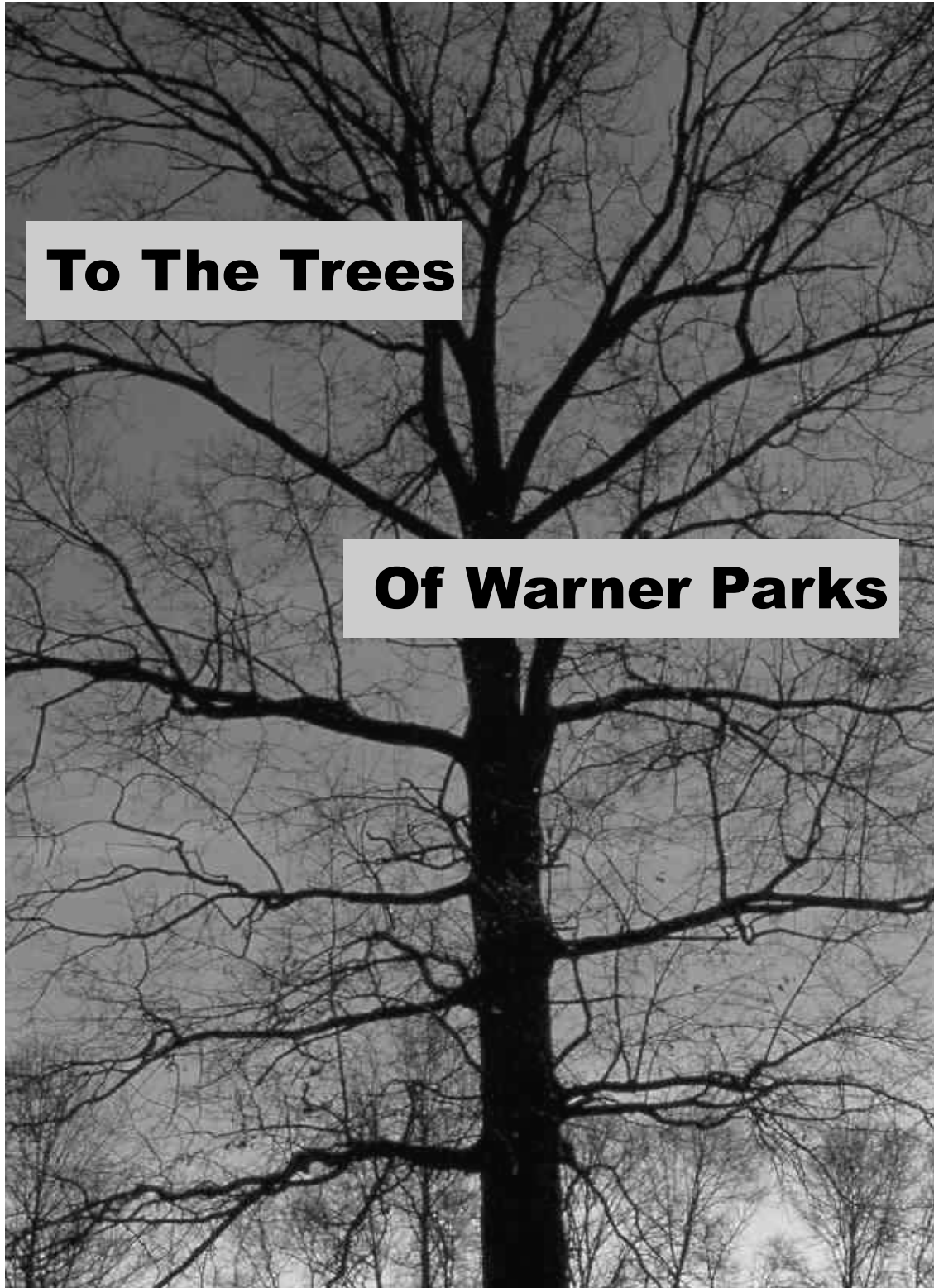
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**To The Trees**

**Of Warner Parks**

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**To The Trees**

**Of Warner Parks**

WINTER TWIG KEY

- 1 Leaves evergreen. See (2)
- 1a Leaves deciduous. See (3)
  
- 2 Leaves scale-like or needle-like, leaves and wood aromatic; fruit (on female trees only) a bluish berry-like cone..... EASTERN RED CEDAR Juniperus virginiana
- 2a Leaves broader with sharp teeth, not aromatic; fruit a red berry (female)....AMERICAN HOLLY Ilex opaca
  
- 3 Leaf scars and buds alternate. See (4)
- 3a Leaf scars and buds opposite. See (38)
  
- 4 Twigs with thorns or spines. See (5)
- 4a Twigs without thorns or spines. See (9)
  
- 5 Terminal bud true. See (6)
- 5a Terminal bud false. See (7)
  
- 6 Thorns short and scattered all over twig; some in rows beneath leaf scar, leaf scar almost encircles very stout twig, many bundle scars.....HERCULES CLUB Aralia spinosa
- 6a Thorns long and located at nodes; leaf scar small and beneath the bud, 3 bundle scars.....  
.....HAWTHORN Crataegus sp.
  
- 7 Thorns in pairs; thorns broad-based; buds appear sunken under the bark (some twigs on mature trees may be thornless) .....BLACK LOCUST Robinia pseudo-acacia
- 7a Thorns singular. See (8)
  
- 8 Thorns located only at nodes and beside the bud; thorns never branched; branches may have knobby spur shoots .....OSAGE ORANGE Maclura pomifera
- 8a Thorns located between nodes and not beside buds; thorns typically branched, red and may be very large; lateral buds tiny, often hidden by leaf scar.....HONEY LOCUST Gleditsia triacanthus
  
- 9 Terminal bud true. See (10)
- 9a Terminal bud false. See (20)
  
- 10 Twigs green and smooth; leaf scars half-round, with a straight top, and a raised, jagged edge; bundle scar appears as one line; twigs aromatic.....SASSAFRAS Sassafras albidum
- 10a Twigs otherwise. See (11)
  
- 11 Bundle scars 3. See (12)
- 11a Bundle scars more than 3, or many scars clustered so that it looks like 3 distinct groups. See (15)
  
- 12 Pith diaphragmed; leaf scar heart-shaped terminal bud about 1/4 inch long and acute with lateral buds divergent; several reddish-brown, smooth bud scales.....BLACK GUM Nyssa sylvatica
- 12a Pith continuous. See (13)
  
- 13 Buds without scales; buds yellowish-brown, wooly; terminal bud elongated; side buds ovoid; twig with rank odor when crushed.....CAROLINA BUCKTHORN Rhamnus caroliniana
- 13a Buds with scales. See (14)

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- 14 Terminal bud ½" – 1" long and sticky-gummy; stipule scar present; leaf scars not crowded; side buds visible..... COTTONWOOD Populus deltoides
- 14a Terminal bud less than ½" long, not gummy; bud scales very shiny and smooth, leaf scars often crowded on spur-like branches, side buds not always visible.....  
.....SWEETGUM Liquidambar styraciflua
- 15 Pith diaphragmed or chambered See (16)
- 15a Pith continuous. See (18)
- 16 Pith chambered; stout twig with large heart-shaped or three-lobed leaf scars; bundle scars loosely clustered in 3 groups; bud scales gray-wooly.....BLACK WALNUT Juglans nigra
- 16a Pith diaphragmed. See (17)
- 17 Stipule scar present, encircling the twig; leaf scar nearly circular with many scattered bundle scars; buds smooth, flattened, 2-scaled (valvate).....TULIP POPLAR Liriodendron tulipifera
- 17a Stipule scar absent; slender twig with rusty, pubescent, fuzzy buds; flower buds round and fuzzy; leaf scar horseshoe-shaped with 5 or 7 bundle scars.....PAWPAW Asimina triloba
- 18 Buds clustered at tips of twigs; if appearing clustered then not bright yellow; bud scales numerous; bundle scars numerous, twig without strong odor..... OAKS Quercus

KEY TO THE OAKS

- a Twigs hairy. See (b)
- aa Twigs smooth. See (c)
- b End buds over 1/8 inch long, most are longer than wide, brown or gray in color, and hairy .....BLACKJACK OAK Quercus marilandica
- bb End buds less than 1/8 inch long, plump, about as long as wide, reddish in color and hairy .....POST OAK Quercus stellata
- c End buds dark red at base with white hairs at the tips, 1/8—1/4 inch long, round and blunt, not usually angular; twigs reddish.....SCARLET OAK Quercus coccinea
- cc End buds otherwise. See (d)
- d Twigs 1/8 inch or less in diameter See (e)
- dd Twigs more than 1/8 inch in diameter See (f)
- e Twigs dark reddish brown; ends buds tiny, less than 1/8 inch long; scales red-brown, hairy.....WILLOW OAK Quercus phellos
- ee Twigs gray brown; largest ends buds over 1/8 inch long; scales reddish with well defined, darker margins.....SHINGLE OAK Quercus imbricaria
- f End buds more red than brown or gray. See (g)
- ff End buds brown or gray. See (i)
- g Twigs and branches with short, stubby, stiff, pin-like side branches, dark brown; buds reddish with darker margins.....PIN OAK Quercus palustris
- gg Twigs and branches without short, stubby, stiff, pin-like side branches See (h)

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- g Twigs and branches with short, stubby, stiff, pin-like side branches, dark brown; buds reddish with darker margins.....PIN OAK Quercus palustris
- gg Twigs and branches without short, stubby, stiff, pin-like side branches See (h)

- h Buds tiny, less than 1/8 inch long, red, round and blunt; twigs red in color especially at the tips.....WHITE OAK Quercus alba
- hh Buds larger than 1/8 inch long, plump; scales with fine hairs along edges; twigs only slightly red on one side (the side exposed to the sun).....NORTHERN RED OAK Quercus rubra
- i Largest end buds densely hairy, over 1/4 inch long, velvety, gray in color, thick and plump; twigs dark brown or reddish brown in color.....BLACK OAK Quercus velutina
- ii Largest end buds not densely hairy See (j)
- j Most end buds flanked by persistent stipules; twigs very light gray; many twigs and young branches with corky wings or ridges; buds light gray with short, dense hairs .....BUR OAK Quercus macrocarpa
- jj Most end buds not flanked by persistent stipules See (k)
- k Largest end buds more than 1/4 inch long, silky hairy; scales brown with paler margins; ..... CHESTNUT OAK Quercus montana
- kk Largest end buds just 1/4 inch or less See (l)
- l Twigs gray to gray brown; buds light brown to grayish, angular, pointed but fairly plump, glabrous .....SHUMARD OAK Quercus shumardii
- ll Twigs yellow brown to orange brown, glabrous; buds red brown to orange brown, less angular; scales with paler margins.....CHINKAPIN OAK Quercus muhlenbergii

18a Buds not clustered at tips of twig, or if appearing clustered then also bright yellow. See (19)

19 Stipule scars present, almost encircling twig; buds many-scaled, smooth, reddish brown, long and very pointed; leaves often persistent.....AMERICAN BEECH Fagus grandifolia

19a Stipule scars absent; large heart-shaped leaf scar with clusters of small bundle scars; end bud larger than side buds.....HICKORIES Carya

#### KEY TO THE HICKORIES

- a End buds bright yellow, fuzzy, appearing naked, without distinct scales. ....BITTERNUT HICKORY Carya cordiformis
- aa End buds otherwise. See (b)
- b End buds 1/4 - 5/8 inch long, round, not hairy. Scales with sparse resin dots .....PIGNUT HICKORY Carya glabra
- bb End buds otherwise. See (c)
- c Largest end buds 1/2 - 3/4 inch long; outer, red-brown scales shed early exposing inner, buff colored, silky scales; twigs reddish-brown and pubescent .....MOCKERNUT HICKORY Carya tomentosa
- cc Largest end buds 3/4 inch or longer; outer scales persistent. See (d)
- d Twigs dark reddish brown; largest end buds 3/4 inch or less; bark shaggy with long, curly strips .....SHAGBARK HICKORY Carya ovata
- dd Twigs orange-brown to buff; largest end buds quite large 3/4 - 1 inch; bark also shaggy .....SHELLBARK HICKORY Carya laciniosa

20 Bundle scars one, or several scars forming one continuous line. See (21)

20a Bundle scars more than one. See (22)

- h Buds tiny, less than 1/8 inch long, red, round and blunt; twigs red in color especially at the tips.....WHITE OAK Quercus alba
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- 21 Pith diaphragmed; twigs dark brownish-gray; buds smooth, black, pointed, with 2 overlapping scales; bundle scar not raised.....PERSIMMON Diospyros virginiana
- 21a Pith continuous; twigs red or reddish-brown; bundle scar raised; buds reddish, smooth, ovoid, and blunt-ended.....SOURWOOD Oxydendrum arboretum
- 22 Twigs with more than one bud above some or all leaf scars. See (23)
- 22a Twigs otherwise. See (26)
- 23 Accessory buds above or below side buds. See (24)
- 23a Accessory buds on one or both sides of the side bud; orange to reddish brown twig with light, round lenticels; leaf scar oval; pith brown.....AMERICAN PLUM Prunus americana
- 24 Side buds sunken under the bark; stout twigs with large triangular leaf scars; 3-5 bundle scars; large salmon-pink, continuous pith.....KENTUCKY COFFEE TREE Gymnocladus dioicus
- 24a Side buds visible, not sunken under bark. See (25)
- 25 Leaf scar almost encircling bud; buds velvety-brown; twigs reddish and dotted with lenticels; 5 bundle scars.....YELLOWWOOD Cladrastis lutea
- 25a Leaf scar beneath the bud; buds black; leaf scars with raised sides, twigs zig-zag; flower buds (when present) often grouped; many scaled, swollen, and stalked.....REDBUD Cercis canadensis
- 26 Bundle scars 3. See (27)
- 26a Bundle scars more than 3. See (33)
- 27 Pith chambered at the nodes and white; slender twig with many pale lenticels  
.....HACKBERRY Celtis occidentalis
- 27a Pith continuous. See (28)
- 28 Leaf scar nearly encircling twig; slender yellowish-brown twig with rank odor; fruits often persistent.....HOP-TREE Ptelea trifoliata
- 28a Leaf scar otherwise. See (29)
- 29 Buds with one cap-like scale; twigs shiny, reddish-brown; stipule scars evident....  
.....BLACK WILLOW Salix nigra
- 29a Buds with more than one scale. See (30)
- 30 Bud scales arranged in 2 vertical rows and imbricate.....ELMS Ulmus
- KEY TO THE ELMS
- a Twigs with corky ridges, gray-brown in color.....WINGED ELM Ulmus alata
- aa Twigs otherwise. See (b)
- b Twigs very rough-hairy and gray, buds red and hairy.....SLIPPERY ELM Ulmus rubra
- bb Twigs without hairs (mostly), buds smooth and brown with dark edges..  
..... AMERICAN ELM Ulmus americana
- \*SEPTEMBER ELM Ulmus serotina is difficult to distinguish with just twigs; they may be winged like WINGED ELM but red-brown in color; mature trees bloom in fall, seed stalks persist
- 30a Bud scales otherwise. See (31)

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- 31 Twigs with acrid smell when scratched; slender reddish-brown, smooth twig with very evident lenticels...BLACK CHERRY Prunus serotina
- 31a Twigs otherwise. See (32)
- 32 Bud scales minutely grooved and with green edges; slender, orange-brown twig; buds ovoid and orange-brown; bark of tree finely shaggy...HOP-HORNBEAM Ostrya virginica
- 32a Bud scales smooth; slender zig-zag reddish-brown twig; buds acute and reddish brown; bark of trunk blue-gray, smooth, sinewy.....AMERICAN HORNBEAM Carpinus caroliniana
- 33 Lateral buds entirely hidden by leaf scars, and flower buds clustered in dense spikes at the tips of twigs; twigs very aromatic, brown, smooth.....FRAGRANT SUMAC Rhus aromatica
- 33a Lateral buds evident and flower buds (when present) otherwise. See (34)
- 34 Twigs and buds densely hairy, buds without scales; leaf scar U-shaped and almost encircling the bud, dead terminal twig often persistent in winter....STAGHORN SUMAC Rhus typhina
- 34a Twigs and buds otherwise. See (35)
- 35 Pith large, round, and brown; stout twig with large, heart-shaped leaf scar, many bundle scars; twig scar very evident.....AILANTHUS Ailanthus altissima
- 35a Pith otherwise. See (36)
- 36 Stipule scar encircling twig; one cap-like bud scale; buds conical and divergent; leaf scar almost completely surrounding the bud .....SYCAMORE Plantanus occidentalis
- 36a Stipule scar otherwise. See (37)
- 37 Bud scales 2 or 3; twigs often zig-zag, greenish or reddish; leaf scar half-round with scattered bundle scars; buds dark red; pith feels slimy when exposed  
.....AMERICAN BASSWOOD Tilia americana
- 37a Bud scales more than 2 or 3; twigs zig-zag, gray-brown; leaf scar round and concave; many scattered bundle scars; bud scales greenish with dark edges...RED MULBERRY Morus rubra
- 38 Terminal bud false. See (39)
- 38a Terminal bud true. See (42)
- 39 Stipule scars prominent; twigs dotted with lenticels; leaf scars half-round with 3-7 bundle scars; buds with 2-4 scales; papery seed pods persist in winter.....BLADDERNUT Staphylea trifolia
- 39a Stipule scars absent. See (40)
- 40 Leaf scars round to oval, and bundle scars form a circle. See (41)
- 40a Leaf scars broadly triangular with edges meetings; 5-7 bundle scars; twigs with large corky lenticels; pith large, round and white.....ELDERBERRY Sambucus canadensis

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- 41 Pith chambered (or hollow); leaf scars never whorled; buds sometimes more than one bud above each leaf scar, fruit husks pecan-like and present in winter.....  
.....PAULOWNIA (PRINCESS TREE) Paulownia tomentosa
- 41a Pith continuous; leaf scars may be whorled, fruits cigar-shaped, often present in winter...  
.....CATALPA Catalpa speciosa
- 42 Bundle scars 3. See (43)
- 42a Bundle scars more than 3. See (47)
- 43 Side buds hidden, only end buds visible; flower buds (when present) round and stalked; vegetative buds slender and pointed; leaf scars very small; twigs greenish to dark purple  
..... FLOWERING DOGWOOD Cornus florida
- 43a Side buds visible. See (44)
- 44 Bud scales 2, valvate. See (45)
- 44a Bud scales more than 2, overlapping.....MAPLES Acer

KEY TO THE MAPLES

- a Twigs green and smooth; narrow, V-shaped leaf scar with opposing tips meeting  
.....BOX ELDER Acer negundo
- aa Twigs red or brown. See (b)
- b Buds brown, sharp-pointed; twigs brown.....SUGAR MAPLE Acer saccharum
- bb Buds red, blunt; twigs reddish. See (c)
- c Twigs with a strong, rank odor when scraped  
.....SILVER MAPLE ( Water Maple) Acer saccharinum
- cc Twigs without a strong, rank odor .....RED MAPLE Acer rubrum
- 45 Buds dark red-brown, densely rusty-hairy; twigs sometimes rusty-hairy, leaf scars narrow; buds short, side twigs somewhat flexible...  
.....SOUTHERN (RUSTY) BLACKHAW Viburnum rufidulum
- 45a Buds brown or gray, not red. See (46)
- 46 Twigs red on one or both sides and finely hairy; buds light brown, slender and hairy; twigs slender and flexible.....ROUGHLEAF DOGWOOD Cornus drummondii
- 46a Twigs brown and smooth; buds grayish or brown, oval and powder-covered; twigs often with stiff, short side shoots.....SMOOTH BLACKHAW Viburnum prunifolium

- 41 Pith chambered (or hollow); leaf scars never whorled; buds sometimes more than one bud above each leaf scar, fruit husks pecan-like and present in winter.....  
.....PAULOWNIA (PRINCESS TREE) Paulownia tomentosa
- 41a Pith continuous; leaf scars may be whorled, fruits cigar-shaped, often present in winter...  
.....CATALPA Catalpa speciosa
- 42 Bundle scars 3. See (43)
- 42a Bundle scars more than 3. See (47)
- 43 Side buds hidden, only end buds visible; flower buds (when present) round and stalked; vegetative buds slender and pointed; leaf scars very small; twigs greenish to dark purple  
..... FLOWERING DOGWOOD Cornus florida
- 43a Side buds visible. See (44)
- 44 Bud scales 2, valvate. See (45)
- 44a Bud scales more than 2, overlapping.....MAPLES Acer

KEY TO THE MAPLES

- a Twigs green and smooth; narrow, V-shaped leaf scar with opposing tips meeting  
.....BOX ELDER Acer negundo
- aa Twigs red or brown. See (b)
- b Buds brown, sharp-pointed; twigs brown.....SUGAR MAPLE Acer saccharum
- bb Buds red, blunt; twigs reddish. See (c)
- c Twigs with a strong, rank odor when scraped  
.....SILVER MAPLE ( Water Maple) Acer saccharinum
- cc Twigs without a strong, rank odor .....RED MAPLE Acer rubrum
- 45 Buds dark red-brown, densely rusty-hairy; twigs sometimes rusty-hairy, leaf scars narrow; buds short, side twigs somewhat flexible...  
.....SOUTHERN (RUSTY) BLACKHAW Viburnum rufidulum
- 45a Buds brown or gray, not red. See (46)
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- 47 Terminal bud more than 1/2 inch long; scales number more than 6; very stout twig  
.....YELLOW BUCKEYE Aesculus octandra
- 47a Terminal bud less than 1/2 inch long; scales number fewer than 6  
.....ASHES Fraxinus

KEY TO THE ASHES

- a Twigs appear square in cross section, with 4 thin ridges (wings)  
.....BLUE ASH Fraxinus quadrandulata
- aa Twigs more round in cross section, not square See (b)
- b Leaf scar U-shaped; the bottom of the bud sits below the two top edges of the leaf scar.....WHITE ASH Fraxinus americana
- bb Leaf scar straight along the top edge; bud sits above entire leaf scar  
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## Tips

- A magnifier is necessary; 10X power with a light is recommended.
- Collect several twigs, make sure the tips are healthy and not damaged.
- Look over the branches thoroughly looking for accessory buds, flower buds and persistent leaves so you can cut those twigs or branches.
- Remember twigs are technically the most current growth on a branch, and are often a different color from the branch.
- Look over the twig and branch carefully, especially the leaf scars and bundle scars, look at all of them to get a sense of the shape, size, number and pattern.
- Often the leaf scars nearest the tip of the twig will be the freshest and easiest to see.
- A true terminal bud will be precisely at the tip of the twig, have one or more leaf scars with it, but NO TWIG SCAR.
- A false terminal bud is slightly off center, will have one or more leaf scars with it, PLUS A TWIG SCAR.
- To see the color and shape of the pith, cut perpendicular to the twig making a good clean cut.
- To see the type of pith (hollow, solid, diaphragmed, chambered) cut longitudinally along twig right through the middle.
- To experience the smell of a twig, scratch it with your thumbnail.
- Remember to use all your senses to get to know a twig: feel it, smell it, notice all the colors.

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## Notes

## GLOSSARY OF TERMS

Accessory bud Bud adjacent to axillary bud. Of two kinds: collateral or superposed.

Alternate Arranged singularly at intervals along twig.

Axillary bud Side buds, first bud above the leaf scar – directly in the upper axil of the leaf.

Bud An undeveloped branch or flower cluster – with or without protective scales.

Bundle scars Tiny dots within the leaf scar caused by the breaking of bundles of ducts leading to the leaf stalk. Round, elongated, curved, etc.

Continuous pith A pith which is solid without any partitions.

Collateral bud Accessory buds at the side of the axillary buds.

Chambered pith A pith with transverse partitions dividing hollow compartments.

Diaphragmed pith Divided crosswise by woody plates; usually best seen at the nodes.

False terminal bud An axillary bud which has taken the position of a terminal bud when the twig dies back to that point. A twig scar, with NO bundle scars inside it, marks the site of the shed twig and lies beside the false terminal bud.

Hollow pith Space for pith there, but empty.

Imbricate Scales that overlap; unlike valvate scales which meet along one line and do not overlap.

Key A device of easily and quickly identifying an unknown object. The user is given a sequence of choices between (usually) two statements and by choosing the correct choice can be identified.

Lateral bud Any bud other than the terminal bud; axillary, collateral, superposed

Leaf scar The mark left on the twig, at the point of attachment of a leaf stalk, when the leaf falls off.

Lenticel A corky spot on the bark originating as a breathing pore and can be circular, stripe-like, or variously shaped.

Mucilaginous Slimy when chewed.

Naked bud Without bud scales; usually covered with hairs for protection.

Node The place on a stem or twig where a leaf is attached or a leaf scar occurs; sometimes swollen.

Opposite Two scars (or buds, or leaves) at a node; in opposing pairs.

Pith The softer central portion of a twig.

Ringed Twig with narrow stipule scars that encircle the twig at leaf scars.

Scale A thin-membrane-like covering of a bud or twig base.

Scale scars Scars left by falling scales.

Side bud Any bud along the side of the twig, not at the tip, also called lateral bud

Spines Technically, modified leaves or stipules; a sharp woody outgrowth.

Stipule A leaf-like growth at the base of the leaf stalk, usually small and in pairs, leaving scars on the twig when they fall.

Superposed bud An accessory bud above the axillary bud.

Terminal bud The true end bud located at the precise tip of the twig marking the end of that year's growth. A leaf scar(s) should be evident here but NO twig scar.

Terminal bud scale scars Rings closely clustered together, forming bands on the twig, left by the falling bud scales and marking the end of each year's growth.

Thorns Technically a modified branch; a woody, pointed outgrowth

Twig The end section of a branch; the current year's growth

Twig scar The scar left by the shed twig (the current year's growth). Located beside and identifying the false terminal bud.

Valvate Bud scales that meet along a definite line without overlapping, with nothing showing in between or underneath the line.

Whorled Arranged in circles at the nodes of the twig.

Winged twig With projecting, thin, flat, corky, membranous outgrowths.

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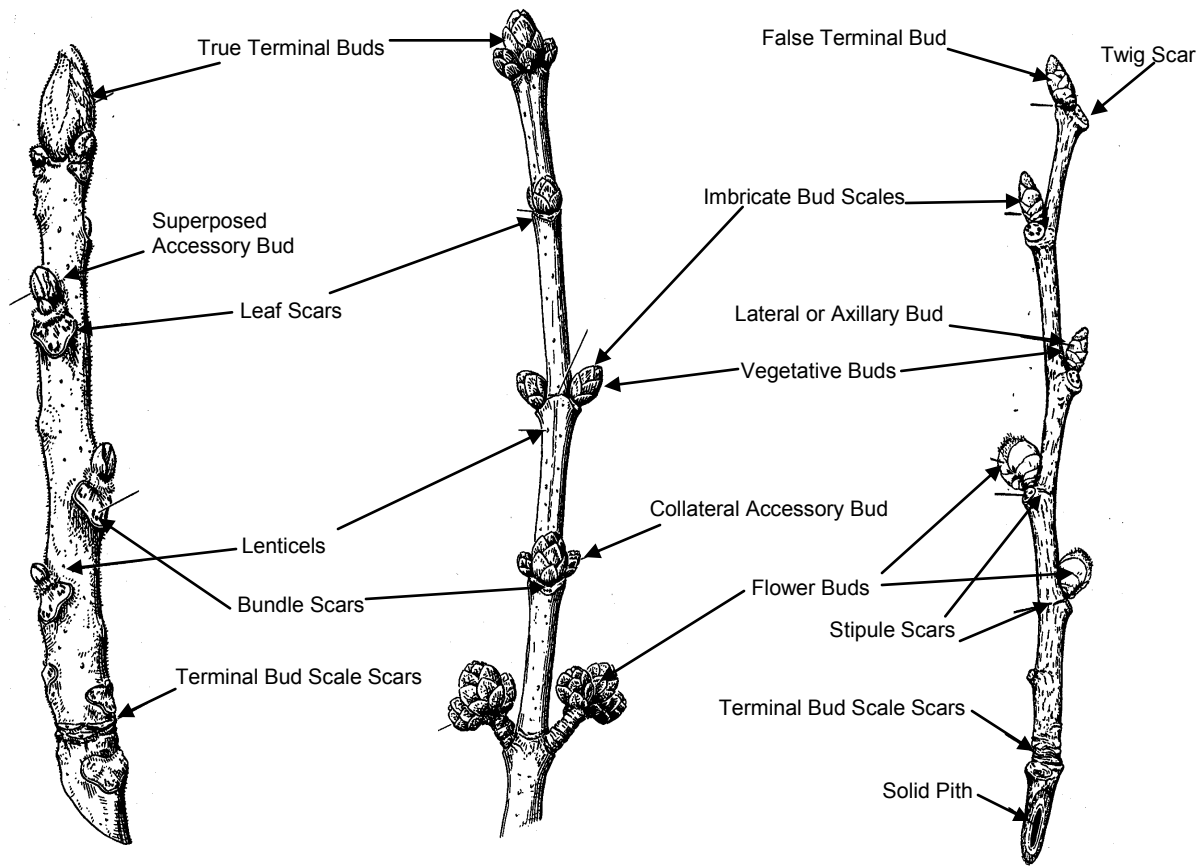
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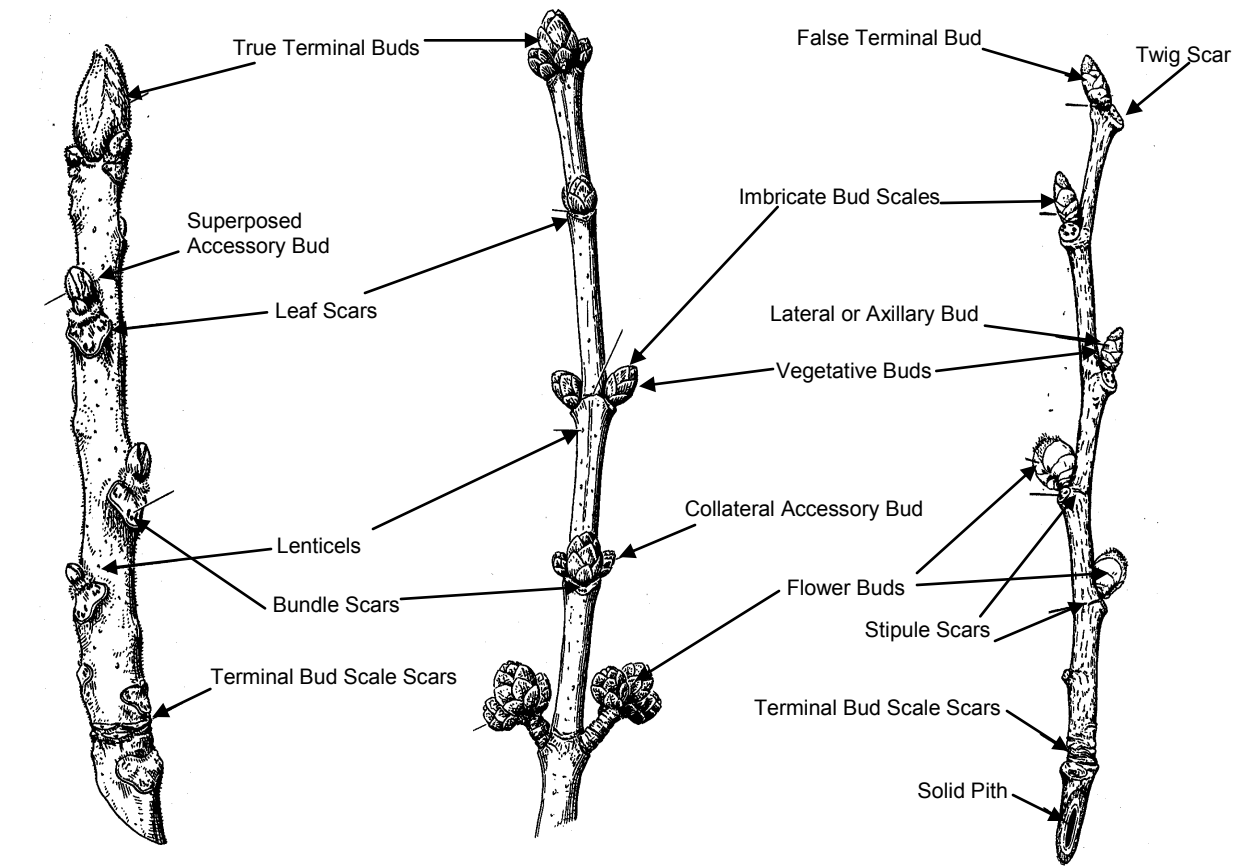
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Alternate arrangement

Opposite arrangement

Alternate arrangement

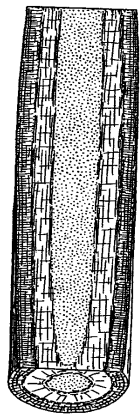


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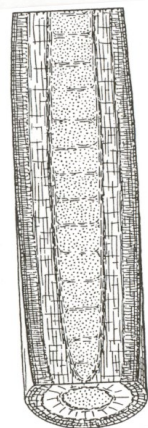
Opposite arrangement

Alternate arrangement

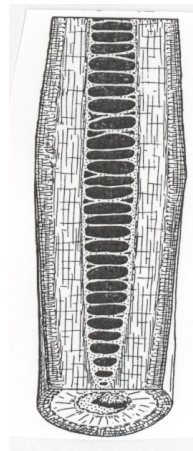
**Some Twig Terminology**



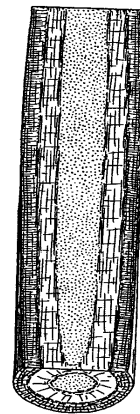
Solid or Continuous Pith



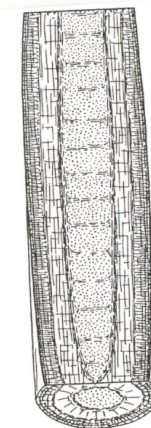
Diaphragmed Pith



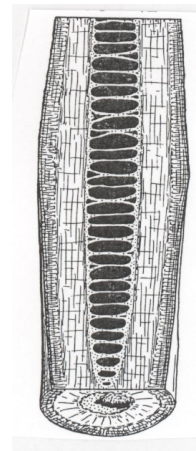
Chambered Pith



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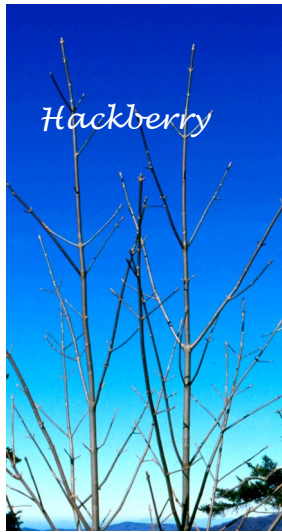
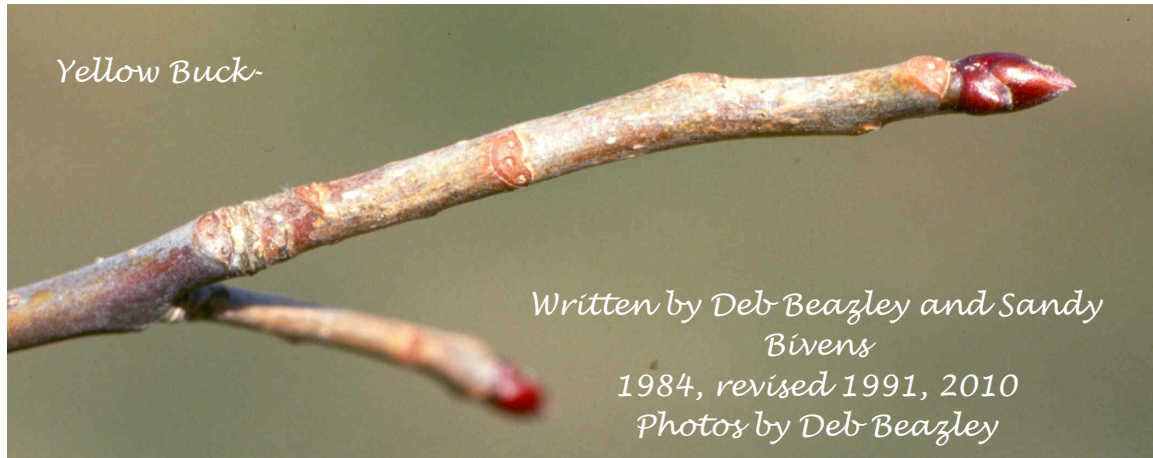


Chambered Pith

**Some Twig Terminology**

\*\* Drawings from Woody Plants in Winter, Core and Ammons; and Guide To Southern Trees, Harrar and Harrar

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**WARNER PARK  
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**METRO  
PARKS  
NASHVILLE**

**FRIENDS  
OF WARNER PARKS**

The logo for Warner Park Nature Center features a stylized building with columns and a bird in flight. The Metro Parks Nashville logo is a black square with white text and a stylized tree. The Friends of Warner Parks logo is a black square with a white heart and a stylized tree.

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