

IDENTIFICATION KEYS

A printed *key* is a means of separating organisms by conspicuous characters, enabling their identification. The most widely used type is the **dichotomous key**. This type of key repeatedly presents two contrasting statements, and the user must follow the statement which applies. Each pair of choices is called a **couplet**, and each statement is called a **lead**. Ideally, each lead will either sufficiently describe a plant, or guide the user to another couplet. There are two kinds of popular formats to the dichotomous key, **indented** and **bracketed**:

Shown below, and on reverse, are examples of an indented and a bracketed key. Both use the same words and include the same species. They help to identify the 11 twigs which are provided to you in the small plastic bags, though at least 22 different species are actually involved. The instructor will supply further information on specific identification of the two species possibilities in each lead.

Indented twig key: Couplets are progressively indented, with each couplet included under the lead having the characters correct for the couplet. Contrasting leads of each couplet are presented after all indented couplets for the prior lead. This type's advantages are that lead numbers or letters are not necessary; plants that share characteristics can be more easily seen as a group; and working backwards in the key is easier. Disadvantages are waste of space, especially if the key is long; and two leads of a couplet may be far apart or difficult to find.

SAMPLE INDENTED TWIG KEY

Leaf scars opposite or whorled

Terminal bud present

Twigs red or green, slender; 3 bundle scars...*Cornus* (dogwood) and *Acer* (maple)

Twigs brownish or gray, more than 3 bundle scars.....*Aesculus* (buckeye) and *Fraxinus* (ash)

Terminal bud lacking

Buds visible, scaled....*Catalpa* (catalpa) and *Broussonetia* (paper-mulberry)

Buds partially sunken, hairy, scaleless.....*Calycanthus* (sweetshrub) and *Philadelphus* (mock-orange)

Leaf scars alternate

Terminal bud present

Terminal bud naked, or scaleless....*Hamamelis* (witch-hazel) and *Asimina* (pawpaw)

Terminal bud scaled

Stipule scars ringlike, encircle nodes.....*Magnolia* (magnolia) and *Liriodendron* (tuliptree)

Stipule scars slitlike, or lacking, not ringlike

Superposed buds present....*Juglans* (walnut) and *Carya* (hickory)

Superposed buds lacking.....*Quercus* (oak) and *Nyssa* (blackgum)

Terminal bud lacking

Spines or spur shoots present.....*Maclura* (Osage-orange) and *Robinia* (black locust)

Spines and spurs lacking

Twigs stout, over 1/4-inch diameter.....*Gymnocladus* (Kentucky coffeetree) and *Ailanthus* (tree-of-heaven)

Twigs slender, less than 1/4-inch diameter.....*Castanea* (chestnut) and *Tilia* (basswood)

(over for comparative key)

Bracketed twig key: The two leads of each couplet are always together. Each lead will either end in a plant name, or a number of the couplet one should read next. Alternate couplets are indented for easier recognition and reading. The advantage of this type is more efficient use of space, and the two leads of each couplet are always together. Disadvantages are that couplet numbers must be used; backtracking is more difficult; and similarities of plant groupings are not so apparent.

SAMPLE BRACKETED TWIG KEY

1. Leaf scars opposite or whorled2
1. Leaf scars alternate.....5
 2. Terminal bud present..... 3
 2. Terminal bud lacking.....4
3. Twigs red or green, slender; 3 bundle scars...*Cornus* (dogwood) and *Acer* (maple)
3. Twigs brownish or gray, more than 3 bundle scars.....*Aesculus* (buckeye) and *Fraxinus* (ash)
 4. Buds visible, scaled....*Catalpa* (catalpa) and *Broussonetia* (paper-mulberry)
 4. Buds partially sunken, hairy, scaleless.....*Calycanthus* (sweetshrub) and *Philadelphus* (mock-orange)
5. Terminal bud present.....6
5. Terminal bud lacking.....9
 6. Terminal bud naked, or scaleless.....*Hamamelis* (witch-hazel) and *Asimina* (pawpaw)
 6. Terminal bud scaled.....7
7. Stipule scars ringlike, encircle nodes.....*Magnolia* (magnolia) and *Liriodendron* (tuliptree)
7. Stipule scars slitlike, or lacking, not ringlike.....8
 8. Superposed buds present; buds with 5 or fewer visible scales....*Juglans* (walnut)
 8. Superposed buds lacking; buds with 6 or more visible scales....*Quercus* (oak)
9. Spines or spur shoots present.....*Maclura* (Osage-orange) and *Robinia* (black locust)
9. Spines or spur shoots lacking.....10
 10. Twigs stout, over 1/4-inch diameter.....*Gymnocladus* (Kentucky coffeetree) and *Ailanthus* (tree-of-heaven)
 10. Twigs slender, less than 1/4-inch diameter.....*Castanea* (chestnut) and *Tilia* (basswood)

**A WINTER KEY TO THE TREES
OF THE SOUTHERN HIGHLANDS RESERVE**

- 1 Leaves evergreen and needlelike or scalelike (conifers).....2
- 1 Leaves broad or thin, not needlelike, though some may be evergreen (broadleaved trees).....8
 - 2 Needles bundled together at base (**pines**).....3
 - 2 Needles singly attached to twig.....5
- 3 Needles 5 per bundle.....*Pinus strobus* (white pine)
- 3 Needles 2 or 3 per bundle.....4
 - 4 Needles nearly always 3 per bundle; cones 3-4 inches long.....*Pinus rigida* (pitch pine)
 - 4 Needles 2 or 3 per bundle; cones 1-2.5 inches long.....*Pinus echinata* (shortleaf pine)
- 5 Needles stiff, with spinous tips..... *Picea rubens* (red spruce)
- 5 Needles flexible, lack spinous tips.....6
 - 6 Needles sessile, very aromatic; twigs moderately stout and stiff.....*Abies fraseri* (Fraser fir)
 - 6 Needles stalked, not so aromatic; twigs slender and flexible (**hemlocks**).....7
- 7 Twigs bear needles in a flattened pattern.....*Tsuga canadensis* (eastern hemlock)
- 7 Twigs bear needles in more of a whorled pattern.....*Tsuga caroliniana* (Carolina hemlock)
 - 8 Leaves present (evergreens).....9
 - 8 Leaves absent (deciduous).....13
- 9 Leaves bear spines on tip or margins.....*Ilex opaca* (American holly)
- 9 Leaves lack spines.....10
 - 10 Terminal buds lacking; laterals hidden behind petiole base.....*Kalmia latifolia* (Mtn. laurel)
 - 10 Terminal buds present, conspicuous.....11
- 11 Leaves dotted beneath, most leaves <3 inches long.....*Rhododendron carolinianum* (Carolina R.)
- 11 Leaves not dotted beneath, most >3 inches long.....12
 - 12 Leaf base tapered; basal bud scales leaflike.....*Rhododendron maximum* (rosebay R.)
 - 12 Leaf base rounded; basal bud scales not leaflike.....*Rhododendron catawbiense* (Catawba R.)
- 13 Leaf scars opposite on twig.....14
- 13 Leaf scars alternate on twig.....20
 - 14 Terminal bud lacking; pith excavated.....*Sambucus canadensis* (elderberry)
 - 14 Terminal bud present; pith solid.....15
- 15 Leaf scars with 1 bundle scar; habit often a large shrub.....*Chionanthus virginicus* (fringetree)
- 15 Leaf scars with 3 or more bundle scars; habit more often treelike.....16
 - 16 Twigs slender, reddish or greenish; leaf scars with 3 bundle scars.....17
 - 16 Twigs stout, not reddish; leaf scars with more than 3 bundle scars.....19
- 17 Bud scales imbricate..... *Acer rubrum* (red maple)
- 17 Bud scales valvate.....18
 - 18 Bark greenish or gray, smooth, often striped.....*Acer pensylvanicum* (striped maple)
 - 18 Bark brown, furrowed or blocky.....*Cornus florida* (flowering dogwood)
- 19 Twigs brownish; bark smooth or scaly.....*Aesculus flava* (yellow buckeye)
- 19 Twigs grayish; bark furrowed..... *Fraxinus americana* (white ash)
 - 20 Spines present on twigs or trunk.....21
 - 20 Spines lacking.....24
- 21 Twigs stout, with numerous scattered prickles..... *Aralia spinosa* (devil's walkingstick)
- 21 Twigs slender or not so stout, spines not as above.....22
 - 22 Spines paired at nodes..... *Robinia pseudoacacia* (black locust)
 - 22 Spines solitary, on spurs or as thorns.....23
- 23 Twigs bear thorns, each with no leaf scars; buds rounded.....*Crataegus* (hawthorns)
- 23 Twigs bear spiny spur shoots, each with many leaf scars; buds pointed.....*Malus* (crabapples)
 - 24 Buds clustered on twig tip, each with more than 8 bud scales (**oaks**).....25
 - 24 Buds not clustered, or if so, then with less than 8 bud scales.....29
- 25 Buds blunt; bark grayish, scaly.....*Quercus alba* (white oak)
- 25 Buds pointed; bark furrowed.....26
 - 26 Bark ridges commonly triangular in cross-section.....*Quercus montana* (chestnut oak)
 - 26 Bark ridges flattened, not as above.....27
- 27 Inner bark yellowish; buds hairy throughout, angular.....*Quercus velutina* (black oak)
- 27 Inner bark pinkish; buds not as above.....28
 - 28 Buds white-hairy beyond middle.....*Quercus coccinea* (scarlet oak)
 - 28 Buds mostly glabrous.....*Q. rubra* (northern red oak)

- 29 Inner bark with wintergreen scent (*birches*).....30
- 29 Inner bark not with wintergreen scent.....31
 - 30 Bark smooth, dark on young stems....*Betula lenta* (black birch)
 - 30 Bark papery, yellowish on young stems.....*Betula allegheniensis* (yellow birch)
- 31 Inner bark with cherrylike or bitter-almond scent.....32
- 31 Inner bark with spicy scent, or no scent.....34
 - 32 Twigs stout; terminal bud ½ inch or more.....*Sorbus americana* (mountain-ash)
 - 32 Twigs slender; terminal buds less than ¼ inch.....33
- 33 Bark and twigs reddish, mostly smooth.....*Prunus pensylvanica* (fire cherry)
- 33 Bark and twigs grayish or dark, scaly on old trunks.....*Prunus serotina* (black cherry)
 - 34 Inner bark with spicy scent....35
 - 34 Inner bark not spicy-scented....38
- 35 Stipule scar lacking; 1 bundle scar.... *Sassafras albidum* (sassafras)
- 35 Stipule scar ringlike, encircling twig; many bundle scars.....36
 - 36 Terminal bud shaped like a duck bill, with 2 scales....*Liriodendron tulipifera* (tuliptree)
 - 36 Terminal bud elongate, with one scale (*Magnolias*).....37
- 37 Terminal bud purplish, smooth; bark gray, smooth....*Magnolia fraseri* (Fraser magnolia)
- 37 Terminal bud white-silky; bark brown, furrowed.....*Magnolia acuminata* (cucumber tree)
 - 38 Buds lack scales, covered with dense hairs or granular surface.....39
 - 38 Buds obviously scaled.....42
- 39 Leaf scar situated under bud; buds tan-colored.....40
- 39 Leaf scars encircle buds; buds dark brown.....41
 - 40 Bark gray, thin, smooth..... *Hamamelis virginiana* (witch-hazel)
 - 40 Bark reddish, papery.....*Clethra acuminata* (mountain pepperbush)
- 41 Twigs stout; pith large....*Rhus* (sumacs)
- 41 Twigs moderately slender; pith not large....*Cladrastis kentukea* (yellowwood)
 - 42 Terminal bud present.....43
 - 42 Terminal bud lacking51
- 43 Bud length over 4 times the width.....44
- 43 Bud length about 3 times the width, or shorter.....45
 - 44 Bundle scars 3; petiole over 1/4" long.....*Amelanchier laevis* (serviceberry)
 - 44 Bundle scars many; petiole often under 1/4".....*Fagus grandifolia* (Am. beech)
- 45 Bundle scar 1 per leaf scar.....46
- 45 Bundle scar 3 or more.....48
 - 46 Spur shoots numerous; conspicuous lenticels on young trunks.....*Ilex montana* (winterberry)
 - 46 Spur shoots and lenticels not as above.....47
- 47 Bark of trunk thin, mostly smooth; small tree or tall shrub.... *Symplocos tinctoria* (sweetleaf)
- 47 Bark of trunk furrowed or scaly; tall tree.... *Halesia tetraptera* (Carolina silverbell)
 - 48 Bark smooth, greenish; twigs lustrous.... *Cornus alternifolia* (alt.-leaf dogwood)
 - 48 Bark rough, gray to brownish; twigs not lustrous.....49
- 49 Bundle scars 3; all larger buds nearly the same size..... *Nyssa sylvatica* (blackgum)
- 49 Bundle scars more than 3; terminal bud conspicuously larger (*hickories*).....50
 - 50 Twigs moderately stout; bark of trunk scaling.....*Carya ovalis* (red hickory)
 - 50 Twigs slender; bark of trunk roughly ridged.....*Carya glabra* (pignut hickory)
- 51 Bundle scar 1.....52
- 51 Bundle scar 3 or more.....53
 - 52 Twigs gray; buds flattened against twig, triangular...*Diospyros virginiana* (persimmon)
 - 52 Twigs reddish; buds dome-shaped....*Oxydendrum arboreum* (sourwood)
- 53 Twigs slender and flexible; buds 1-scaled..... *Salix* (willows)
- 53 Twigs moderately stout or stiff; buds with 2 or more scales.....54
 - 54 Buds with 4 or more scales; bark scaly.....*Morus rubra* (red mulberry)
 - 54 Buds mostly 2-3-scaled; bark smooth when young, becoming furrowed.....55
- 55 Twigs and buds reddish.....*Tilia heterophylla* (white basswood)
- 55 Twigs brown or red-brown (*chestnuts*).....56
 - 56 Twigs glabrous, lustrous; an upright tree....*Castanea dentata* (American chestnut)
 - 56 Twigs hairy, dull; shrubby habit.....*Castanea pumila* (chinquapin)