

Identifying Hickory and Walnut Trees Native to Tennessee Using BRFs (Brief Recognizable Features)



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Introduction

Hickories truly are an American group of trees. Of the world's 23 known hickory species, only three are found outside the United States (Harrar 1962). Hickory wood is widely acclaimed for its strength and durability. Gen. Andrew Jackson was nicknamed "Old Hickory" during the Battle of New Orleans because he was as "tough as hickory." As a natural resource, hickory wood played a vital role in the development of Tennessee and the nation. Hickory wood was prized for tool handles due to its strength and ability to absorb shock. The wood also was used for fence posts, furniture, interior furnishings and firewood for heating and cooking. The use of hickory for cooking and smoking meats was common, especially in the South where it remains a favorite source of wood for the smokehouse. The wood is heavy, dense, very hard, tan or light brown in color, and has considerable character. Today it is often selected for cabinets and flooring due to its attractive appearance, although milling and manufacturing can be slow because of its tough physical properties. Hickory drumsticks and handles for hammers, axes and other striking tools also remain unmatched for minimizing muscle fatigue.

Hickory nuts were once an important and common human food source. The kernels inside the nuts were crushed and

added to baked goods, broth, cornmeal and mush. Native Americans boiled the nuts of both walnuts and hickories to produce oil. They also used the broth as a nutritious drink or soup (Fritz et al. 2001). Hickory and walnut trees can be tapped just like maple trees to make syrup, although hickory sap contains less sugar than maple (Peterson 1977). The nuts are a valuable food source for squirrels, mice, bear, fox, rabbit and weevils. Hickory trees grow moderately slowly, often resulting in very narrow annual growth rings and dense wood. Some species, such as sand and pignut hickories, are found often on drier hilltops and side slopes, while others, such as water and shellbark hickories, occur most often in moist drainages and near swamps.

Collectively, hickory species account for approximately 8 percent of all live trees (≥ 5 inches in diameter at 4.5 feet above the ground) and 9 percent of the net volume of wood of live trees on forestland in Tennessee (Miles 2012). Due to its modern uses described above, hickory is very important to the forest products industry and is an asset to forest landowners, who derive income from selling hickory timber.

Purpose

This publication introduces readers to brief recognizable features, or "BRFs" (pronounced "briefs"), which are unique features that are easy to remember, and summarize the most distinguishing primary and secondary characteristics of species that can be used for accurate identification. There are 10 hickory species native to Tennessee: **bitternut, mockernut, pecan, pignut, red, sand, shagbark, shellbark, southern shagbark and water**. Two walnut species also are native — **black walnut and butternut** (or white walnut). Walnut trees are closely related to hickories, and they have many characteristics in common. Therefore, they also have been included in this guide. To confirm identification, a dichotomous key is included at the end of the publication.

Getting Started

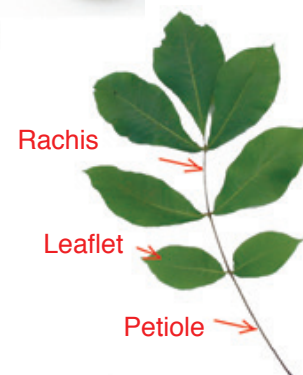
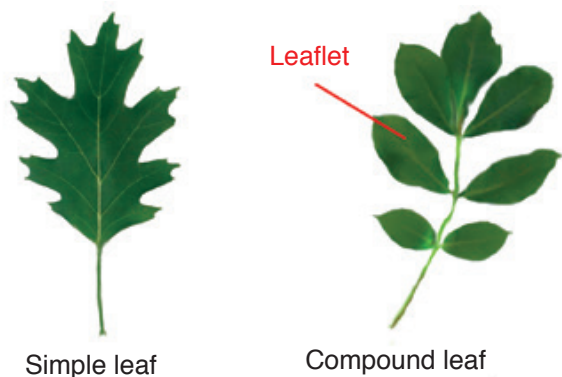
To begin, first determine if your unknown tree is a hickory or walnut tree.

Leaf characteristics can be used to distinguish hickory and walnut from other species, but to identify the particular hickory or walnut species, it is helpful to have the fruit and to observe some twig and bark features.

- **Compound leaves** — Hickories and walnuts have pinnately compound leaves that are arranged alternately along the twig. *Compound* leaves have several smaller separate leaflets that collectively form a larger leaf. In pinnately compound leaves, the leaflets are arranged along a central stalk (the rachis). Note that although the leaves have an alternate arrangement along the twig, the leaflets commonly have an opposite arrangement along the rachis. The margins of the leaflets of all hickories and walnuts are serrated. In contrast, *simple* leaves have a single leaf blade that may be unlobed or may have several lobes such as the oak leaf (example shown), but these lobes are not completely separated into distinct leaflets.
- **Fruit** — Hickory and walnut fruits consist of a husk surrounding a nut. The husk of most hickory fruit splits along distinct suture lines when mature to expose a smaller interior nut. The shells of walnut and hickory nuts, generally quite hard, protect a very nutritious kernel. In contrast to the husks surrounding hickory nuts, the husk of a walnut fruit is somewhat spongy and does not split open because it lacks sutures. The nuts of walnuts also have a more corrugated and rough surface than hickory nuts.
- **Twigs** — The twigs of hickory trees are mostly stout, and all have a true terminal bud at the end of the twig. The leaf scars that form where the leaves fall off are somewhat heart- or shield-shaped in hickories and are more three-lobed in walnuts. If a walnut twig is cut in half, the center (or pith) will be divided into distinct chambers that are darker than the surrounding wood. The pith of a hickory twig is solid and generally light in color.
- **Bark** — Hickory bark is hard and durable, sometimes separating into long scales, other times occurring in distinct ridges.

Familiarity with these additional terms will help readers identify hickory and walnut trees:

- **Pubescent** — Having fine hairs.
- **Glabrous** — Having a smooth, hairless surface.
- **Terminal bud** — The uppermost bud located at the tip of the twig.
- **Leaflets** — Individual leaf blades that collectively form a compound leaf.
- **Petiole** — Stalk of a leaf that attaches to the twig.
- **Pinnate** — A compound leaf arranged with several leaflets on each side of the leaf stalk.
- **Rachis** — The extension of the petiole above the lower leaflets.
- **Sutures** — Joints between pieces of a husk.



Pinnately Compound leaf

Hickories At a Glance

Hickories can be grouped by bark, leaf and fruit characteristics. Prior to examining each species in detail, readers can narrow the identification of their species by considering some of these BRFs. Review the following

table as a quick guide. Note that the number of leaflets for hickories can be quite variable, and positive identification may require the use of twig, fruit and/or bark characteristics.

Brief Recognizable Features (BRF's)	Possible Hickories (walnut omitted)
Tree with long plates of shaggy (scaly), peeling bark	Shagbark Shellbark Southern shagbark Water
Leaflets usually 5 per leaf	Pignut Shagbark Southern shagbark
Leaflets mostly 7 per leaf	Mockernut (also 9 leaflets) Red Sand Shellbark
Leaflets 9 or more per leaf	Bitternut Pecan Water Mockernut
Yellow color to terminal bud	Bitternut (mustard yellow pubescence) Sand (yellow resin dots)
Fruit husks having ridges along the sutures	Bitternut Pecan Red (sometimes) Water
Fruit very large (>2 inches in diameter)	Mockernut Pecan (occasionally) Shagbark Shellbark
Fruit with very thick husk (to 0.5 inch thick)	Shagbark Shellbark Southern shagbark
Petiole and/or underside of leaf surface pubescent (or slightly so)	Mockernut (reliable) Sand (reliable) Shagbark (variable) Shellbark (reliable) Southern shagbark (frequently glabrous)

Hickories Native to Tennessee

Bitternut Hickory (*Carya cordiformis* [Wangenh.] K. Koch)

Bitternut hickory is found throughout Tennessee and on a variety of sites, including rich, loamy or gravelly soil, low wet woodlands, and along stream borders. As its name implies, the nut of this species is bitter. Pg. 10.

Mockernut Hickory (*Carya tomentosa* [Lam. ex Poir.] Nutt.)

Mockernut hickory is found throughout Tennessee, generally on moderately fertile uplands but also on dry

ridges and side slopes. Although somewhat difficult to crack, the kernel inside the nut is sweet. Pg. 11.

Pecan (*Carya illinoensis* [Wangenh.] K. Koch)

Pecan is located primarily in western Tennessee where it occurs both naturally and in planted orchards. Normally, it is found on deep, moist, but well-drained soils along creeks and drainages. The nutmeat of the pecan is sweet and is a favorite in pies and other baked goods, as a topping for other desserts, or as a snack. Pg. 12.

Pignut Hickory (*Carya glabra* [Mill.] Sweet)

Pignut hickory can be found throughout Tennessee, generally on dry ridges and hillsides with well-drained soils. Often, the nut of the pignut, although sometimes edible, is rather bitter. Pg. 13

Red Hickory (*Carya ovalis* [Wangenh.] Sarg.)

Red hickory is common throughout Tennessee, usually on dry, well-drained upland ridges and slopes and is found alongside Pignut hickory. Sometimes it is referred to as sweet pignut because its nut is sweet, while that of pignut is typically bitter. Pg. 14.

Sand (Pale) Hickory (*Carya pallida* [Ashe] Engl. & Graebn.)

Sand hickory is located sporadically in Tennessee, most commonly in the Cumberland Plateau region, particularly on dry uplands. Typically, the nut of this species is sweet. Pg. 15.

Shagbark Hickory (*Carya ovata* [Mill.] K. Koch)

Shagbark hickory is common throughout Tennessee and is tolerant of both dry and moderately moist soils, growing along creeks, in mountain coves, and on hilltops and slopes. The nut is sweet and is sometimes produced and sold commercially. Pg. 16.

Shellbark Hickory (*Carya laciniosa* [Michx. f.] G. Don)

Shellbark hickory has a sporadic presence in Tennessee with the greatest concentrations in the Mississippi and Tennessee River bottoms and in the western Highland Rim in Middle Tennessee. Primarily, it is a bottomland species, often found on deep, moist, but well-drained soils. The very large nut of this species also is sweet. Pg. 17.

Southern Shagbark Hickory (*Carya caroliniana-septentrionalis* [Ashe] Engl. & Graebn.)

Southern shagbark hickory is scattered throughout Tennessee but is most common in the Central and South-central regions. It grows on upland ridges and side slopes, particularly on limestone-derived soils. Like the larger fruit of the shagbark and shellbark, the nut of southern shagbark is sweet. Pg. 18.

Water Hickory (*Carya aquatica* [Michx. f.] Nutt.)

Water hickory has a very limited presence and range in Tennessee, restricted to the Mississippi River basin in the far Western region. Although it is found more often on poorly drained, heavy clay soils (where it can outcompete other hardwoods), it prefers better-drained soils. Typically, the small, flattened nut of this species is bitter. Pg. 19.

Walnuts Native to Tennessee**Black Walnut** (*Juglans nigra* L.)

Black walnut is located throughout Tennessee, with greater concentrations in the North-central and Eastern regions. It prefers deep, moist, well-drained sandy-loam soils along creeks and rivers but can be found growing across a wide variety of sites. The nutmeat is sweet and difficult to extract from the nut. The husk ripens from green to a dark brown color and contains a natural dye that has long been used to color cloth and yarn. Pg. 8.

Butternut (*Juglans cinerea* L.)

Butternut is an endangered species in Tennessee and is found infrequently in the Central and Eastern regions where it grows in coves, on slopes and along stream banks. It prefers well-drained rich soils. The nutmeat is considered by some to be even richer and sweeter than that of walnut, and the natural dye in the husk produces a tan to brown color. Pg. 9.

Dichotomous Key to Tennessee Hickory and Walnut Trees

To determine if your unknown tree sample is a hickory or walnut, first, figure out whether the leaves are pinnately compound and arranged alternately along the twig. There should be at least five leaflets, and the margins of the leaflets should be serrate. By late summer, a true terminal bud will be located at the end of the twig, and once the leaves fall, the leaf scar will be heart-shaped, shield-shaped or three-lobed. Any fruit present will be in the form of a nut surrounded by a husk.

Instructions: Once you have determined that your sample is either a hickory or a walnut, compare it to the first contrasting pair of characteristics (1a/1b) in the key on pages 5-6. Select the best fit. Either the name of the species is listed at the end of the list of characteristics, or the number of the next pair of contrasting statements is listed. Follow the key until it ends in the name of a species, and then compare your sample with the description included in this publication. (Items in bold are especially helpful for identification.)

Key to Tennessee Hickories

No.	Description	Proceed to Next Number Set
1a	Leaflets 11 to 24; leaf scars are mostly three-lobed twig with chambered pith ; fruit with thick, fleshy outer husk, lacking sutures ; nut with rough, corrugated surface . (<i>Juglans</i> — Walnuts)	2
1b	Leaflets 5 to 17 (mostly 5 to 13, but sometimes up to 21); leaf scars more heart- or shield-shaped, but can be three-lobed); twigs with pith not divided into chambers ; fruit husk not fleshy , somewhat woody, with sutures; nut with 2 to 6 ribs, not corrugated . (<i>Carya</i> — Hickories)	3
2a	Leaflets 11 to 17, terminal leaflet typically present; leaflets pubescent on lower surface; dark, gland-tipped hairs present on the lower petiole; leaf scar with pad of hairs along the upper margin; fruit more oblong than round, husk with sticky, resinous hairs on the surface; bark with flattened, ash-colored ridges.	Butternut <i>J. cinerea</i>
2b	Leaflets 15 to 24, terminal leaflet often absent; leaflets pubescent on lower surface; petiole short and pubescent, lacking long glandular hairs ; leaf scar lacks pad of hairs on upper margin; fruit round , smooth, husk, lacking sticky resinous hairs ; bark dark brown .	Black walnut <i>J. nigra</i>
3a	Leaflets 7 to 17; terminal bud scales valvate (not overlapping, similar to the halves of a clamshell), sometimes appearing naked; fruit husks with ridges along sutures .	4
3b	Leaflets mostly 5 to 9; terminal bud scales imbricate (overlapping like shingles on a roof); fruit husks lack ridges along sutures.	6
4a	Leaflets 7 to 9 (commonly 7), some with silvery scales below; terminal bud sulfur yellow ; fruit with thin husk, four sutures with ridges above the middle, ending in a point , retains green color into autumn.	Bitternut <i>C. cordiformis</i>
4b	Terminal bud silvery-brown to dark brown, not sulfur yellow; leaflets typically 7 to 13, some to 21.	5
5a	Leaflets typically 11 to 17 (up to 21), falcate (curved or sickle-shaped), with conspicuous curve to midvein; terminal bud silvery-brown ; fruit elliptical with thin husk and ridges along sutures; bark with gray-brown scales and cream-colored inner bark.	Pecan <i>C. illinoensis</i>
5b	Leaflets 7 to 11, somewhat falcate; lower leaf surface may have maroon hairs; terminal bud brown to dark brown; fruit conspicuously flattened, four-angled , with ridges along sutures; bark peeling in long, strips or scales, often somewhat reddish.	Water <i>C. aquatica</i>
6a	Leaflets mostly 5 (less commonly 7).	7
6b	Leaflets mostly 7 to 9 (seldom 5).	9
7a	Leaflets mostly 5 (sometimes 7); leaves, rachis and twig glabrous ; fruit pear-shaped , thin husk, with sutures not splitting to base of fruit; bark ridged, not with shaggy plates.	Pignut <i>C. glabra</i>

No.	Description	Proceed to Next Number Set
7b	Leaflets typically 5 (sometimes 7); leaflets usually (somewhat) pubescent, although can be almost glabrous; terminal bud lightly to very pubescent; fruit round , with thick husk (0.25 inch to 0.5 inch), splitting to base; bark gray, exfoliating into large, thin, shaggy plates .	8
8a	Leaves 8 to 18 inches long, variable pubescence on lower leaf, petiole and twig; persistent tufts of hairs on leaflet margins near teeth; twigs stout ; terminal bud long (to 0.75 inch), tan, pubescent, with darker persistent outer scales ending in stiff points ; fruit round, 1.5 to 2 inches wide, with thick husk (to 0.5 inch) and small nut.	Shagbark C. ovata
8b	Leaves 8 to 12 inches long, leaflets and petiole mostly glabrous ; twigs more slender, dark to almost black ; terminal bud lightly pubescent, reddish-brown to black (to 0.6 inch); fruit smaller (1 inch), with thick husk (to 0.5 inch); more typical of sites with limestone bedrock.	Southern shagbark C. carolinense-septentrionalis
9a	Leaflets mostly 7 (sometimes 5), glabrous leaflets and petiole, petiole at base of rachis often reddish ; fruit round, with thin husk (<0.13 inch); sutures splitting to base of nut; bark ridges somewhat scaly.	Red C. ovalis
9b	Leaflets 7 to 9; leaves with dense pubescence along rachis and/or on undersurface of leaves.	10
10a	Leaflets mostly 7 (sometimes 9); leaflet lower surface densely covered with silvery, round scales ; rachis densely covered with curly clusters of hairs ; terminal bud and twig with yellow resin dots ; twig slender; fruit with thin husk and yellow resin dots , often retains some green color.	Sand C. pallida
10b	Leaves large with 7 or 9 leaflets; lower surface of leaf and rachis very pubescent ; terminal bud large and very pubescent ; twig stout; fruit with husk at least 0.25 inch thick; bark scaly or not.	11
11a	Leaves very large (to 24 inches); leaflets mostly 7 (sometimes 9); pubescent below and along rachis; terminal bud long (to 0.75 inch) with persistent, dark outer scales ; fruit very large (up to 3.5 inches), with very thick husk (0.5 inch) and very large seed; bark is slate gray, with large, loose shaggy plates .	Shellbark C. laciniata
11b	Leaves large (to 20 inches); leaflets 9 (sometimes 7); leaflets and rachis densely pubescent; terminal bud with “onion dome” shape , outer scales shed in autumn, revealing cream-colored, pubescent bud ; twig very stout; fruit with moderately thick husk (0.25 inch) and sutures that split to base of nut; bark with broad interlacing, diamond-shaped ridges with shallow furrows.	Mockernut C. tomentosa

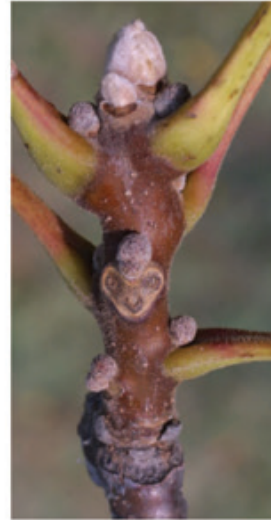
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Black Walnut - *Juglans nigra* L.



Black walnut bark with dark brown flattened ridges.
(Photo by D. Mercker)



The leaf scar of black walnut has three lobes and does not have a pad of hairs along the upper surface. The leaf petioles also lack the glandular hairs typical of butternut.
(Photo by S. Baskauf)



Chambered pith in a black walnut twig.
(Photo by K. Kuers)



A cluster of black walnut fruit. (Photo by K. Kuers)



Black walnut leaves. Note the (normally) missing terminal leaflet. (Photo by K. Kuers)

Butternut - *Juglans cinerea* L.



Note the light color of the flattened ridges of butternut. (Photo by D. Mercker)



Butternut terminal bud. Note the glandular hairs along the petiole and twig. (Photo by K. Kuers)



Butternut typically retains its terminal leaflet unlike black walnut. (Photo by S. Baskauf)



Note the pad of hairs above the butternut leaf scar. (Photo by G. Fewless)



Butternut fruit is more elongated than that of black walnut, and it is very sticky. Note also the corrugated nut, typical of both butternut and black walnut. (Photo by D. Mercker)

Bitternut hickory - *Carya cordiformis*



The bark of bitternut hickory is normally gray and separates into narrow ridges with narrow fissures. It sometimes resembles the bark of pecan. (Photo by D. Mercker)



The mustard-yellow, almost naked looking terminal bud of bitternut. (Photo by K. Kuers)



Bitternut typically has nine or more leaflets. (Photo by K. Kuers)



Note the ridges along the sutures of this green bitternut fruit. (Photo by D. Mercker)



The husk of bitternut is distinctly thinner than that of mockernut or Shagbark. (Photo by S. Baskauf)

Mockernut hickory - *Carya tomentosa*



Note the widely spaced ridges in the bark of mockernut. Bark can resemble black walnut bark somewhat, but is more gray and less brown in color. (Photo by W. Cook)



Large bulb-shaped bud of mockernut hickory. The outer scales will fall off in winter, revealing the inner cream-colored bud scales. (Photo by K. Kuers)



Mockernut hickory commonly has nine leaflets, although sometimes there are only seven. (Photo by K. Kuers)



The fruit of mockernut hickory has a husk that is thicker than that of red or pignut hickory but thinner than that of shagbark hickory. (Photo by S. Baskauf)



The undersurface of the mockernut hickory leaf with its dense mat of hairs. (Photo by K. Kuers)



Mockernut fruit (left) and shagbark fruit (right). (Photo by D. Mercker)

Pecan - *Carya illinoensis*



The bark of pecan varies in color from yellow-brown to gray-brown and from flattened to slightly scaly with age. (Photo by D. Mercker)



The leaflets of pecan are typically somewhat curved, or falcate, with a midvein that is off-center. (Photo by S. Baskauf)



The terminal bud of pecan is silvery-gray to tan. (Photo by B.E. Wofford)



Pecan fruit has an oblong shape. Its thin husk has ridges along the sutures. (Photo by S. Baskauf)



Pecan fruit not yet fully ripe. (Photo by D. Mercker)

Pignut hickory - *Carya glabra*



The bark of pignut hickory is very difficult to differentiate from that of red hickory. (Photo by D. Mercker)



The terminal bud and twig of pignut hickory are glabrous like the leaves. (Photo by S. Baskauf)



Pignut hickory has five leaflets, and the rachis and petiole are glabrous, lacking hairs. (Photo by D. Mercker)



The thin husk of pignut hickory fruit does not split open readily, and the fruit is recognized easily by its elongated "snout." (Photo by B.E. Wofford)

Red hickory - *Carya ovalis*



The bark of red hickory has small, tight scales.
(Photo by D. Mercker)



Red hickory leaves are commonly glabrous with seven leaflets. Pignut hickory typically has five leaflets.
(Photo by S. Baskauf)



Note that the base of the petiole is distinctly red on the red hickory.
(Photo by S. Baskauf)



Red hickory fruit is more rounded than that of pignut and also tends to split open along the sutures.
(Photo by S. Baskauf)

Sand (Pale) hickory - *Carya pallida*



The broadly spaced, flattened ridges of sand hickory bark. (Photo by D. Mercker)



Sand hickory commonly has seven leaflets, although sometimes it has nine. (Photo by D. Mercker)



The rachis of sand hickory is covered with irregular clumps of hairs. (Photo by S. Baskauf)



Sand hickory bud covered with silvery to yellow scales. (Photo by K. Kuers)



The husk of sand hickory is thin and tends not to split open readily along the sutures. (Photo by B.E. Wofford)



The fruit of sand hickory also is coated with yellow scales. (Photo by S. Baskauf)

Shagbark hickory - *Carya ovata*



The shaggy bark of shagbark hickory.
(Photo by D. Mercker)



Shagbark hickory typically has five leaflets, and the rachis and petiole are generally somewhat pubescent.
(Photo by D. Mercker)



Shagbark hickory has a large, pubescent terminal bud with dark outer scales that end in stiff points. (Photo by B.E. Wofford)



Shagbark hickory fruit. (Photo by D. Mercker)



Shagbark hickory fruit has a very thick husk (up to half an inch thick) with a nut that is relatively small.
(Photo by S. Baskauf)

Shellbark hickory - *Carya laciniosa*



Shellbark hickory has very shaggy bark.
(Photo by S. Baskauf)



The large terminal bud of shellbark hickory.
(Photo by S. Baskauf)



Shellbark hickory has a very large pubescent leaf with seven leaflets, rather than the five that are typical of shagbark.
(Photo by S. Baskauf)



The very large nut of shellbark within its very thick husk. (Photo by D. Mercker)

Southern shagbark - *Carya carolinae-septentrionalis*



Southern shagbark hickory is one of the four shaggy bark hickories native to Tennessee. (Photo by S. Baskauf)



The twigs and terminal bud of southern shagbark are thinner than those of shagbark. They also are more glabrous and tend to blacken with age. (Photo by S. Baskauf)



The leaf of southern shagbark has five leaflets. Generally, it is somewhat smaller than that of shagbark hickory and is often glabrous. (Photo by S. Baskauf)



Southern shagbark leaf and fruit. (Photo by K. Kuers)

Water hickory - *Carya aquatica*



Water hickory bark often has a reddish hue. (Photo by D. Mercker)



The terminal bud of water hickory is similar in appearance to that of pecan. (Photo by B.E. Wofford)



The somewhat shaggy bark of the water hickory. (Photo by D. Mercker)



The fruit of water hickory is somewhat flattened with distinctly raised ridges along the sutures. (Photo by D. Mercker)



Water hickory leaf and fruit. (Photo by R. Lance)

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