Trees with Compound Leaves: Identification Guide of Common Georgia Species



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Introduction

Have you ever struggled differentiating a black walnut tree from a pecan tree? Or maybe you have trouble differentiating hickory or ash species?

Leaves are a common tree identification (ID) characteristic. One important process in narrowing down the ID of a tree species is determining what type of leaf a tree has. The two main types of plant leaves are simple leaves and compound leaves. Most native Georgia tree species have simple leaves; however, several have compound leaves. This publication will first describe the morphology of compound leaves and then provide image-based ID characteristics of nineteen common native tree and shrub-like tree species that occur in the state. Tree ID descriptions are organized alphabetically by family name and common name (see Table of Contents).

Several terms are defined in the Glossary at the end of the publication.

Compound Leaf Morphology

Leaves are one of the primary organs of a plant. They conduct critical services for the plant, including photosynthesis (food production for the plant) and transpiration (water movement in the plant). Ecologically, leaves lower ambient air temperatures, slow the impact of rainfall, contribute to soil organic matter, reduce soil erosion, store carbon, are an important food source for wildlife, and more. From a human perspective, leaves cool the air through shading, create beauty, improve health and well-being, and provide many more ecological services, as listed above.

Leaves occur in varying colors, shapes, sizes, surface qualities (e.g., pubescent/ "hairy," smooth, rough, etc.), and margins (e.g., sawtooth/serrated, smooth, lobed, etc.) (Fig. 1). Leaves also have variable leaf vein patterns, petiole lengths, and scents (when crushed). Some species' leaves even have a specific taste (e.g., sourwood leaves), but avoid tasting any leaf for safety reasons unless you are confident of its ID.

Leaves are arranged along a stem or twig in three primary ways: alternate, opposite, and whorled (Fig. 1). Alternate leaves have one leaf that emerges from each node. Opposite leaves have two leaves that emerge per node and whorled leaf species have more than two leaves per node. Leaf arrangement is an important ID characteristic. Most Georgia tree and tree-like shrub species have alternate leaf arrangement, with a smaller percentage having opposite and whorled leaf arrangement. For example, oak, hickory, elm, and sweetgum trees have alternate leaf arrangement. Ash, dogwood, maple, and elderberry species have opposite leaf arrangement and catalpa has both opposite and whorled leaf arrangement.

Leaves are attached to a twig at a node near a lateral bud (Fig. 1). There are two main types of leaves: simple leaves and compound leaves (Fig. 2). A simple leaf contains one leaf blade that is attached to the twig with a petiole. A compound leaf contains more than one leaf blade (or leaflet), where the leaflets are attached to a rachis (or petiole, in the case of palmately compound leaves) which is attached to a petiole and the twig (Fig. 2). Note that the location of the lateral bud on a twig helps one determine if they are looking at a compound or simple leaf. A compound leaf will not have lateral buds adjacent to the leaflets.

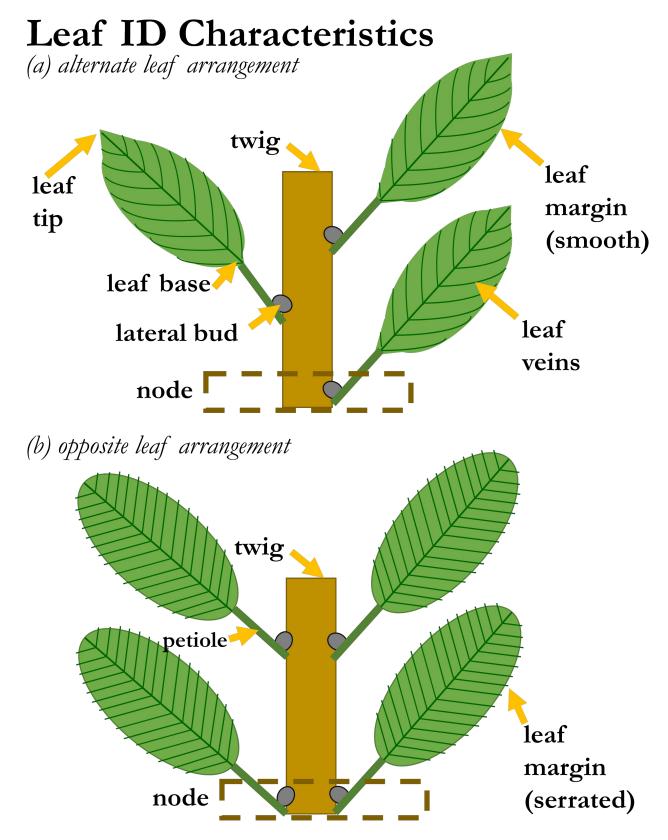
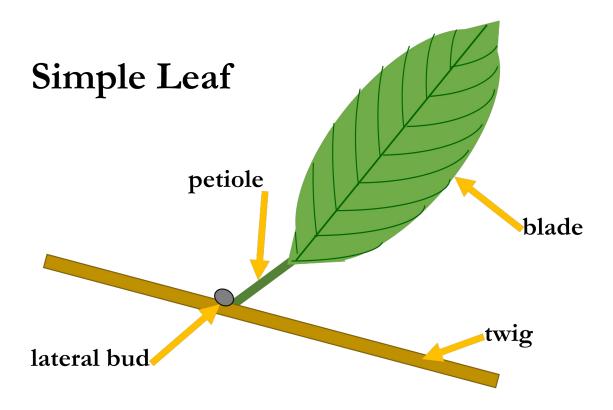


Figure 1: (a) Twig segment demonstrates alternate leaf arrangement with one leaf (and one lateral bud) occurring at each node, as well as parts of a leaf (leaf tip, leaf base, leaf veins) and a smooth leaf edge. (b) Twig segment demonstrates opposite leaf arrangement with two leaves (and two buds) occurring at each node, location of the petiole, and a serrated leaf margin.



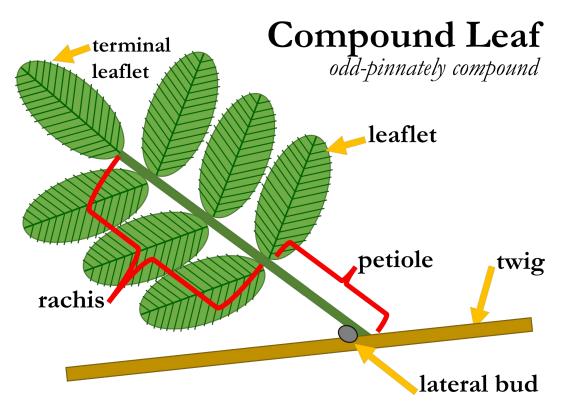


Figure 2: Diagrams of simple and compound leaves. The top diagram displays the leaf blade, petiole, twig, and location of the lateral bud on a simple leaf. The bottom diagram displays a compound leaf, noting the location of the petiole and rachis, leaflets, lateral bud, and twig. The terminal leaflet is noted since it may be absent on some species. Also, this diagram is an odd-pinnately compound leaf (meaning it has an odd number of leaflets).

There are several types of compound leaves, including pinnately, trifoliate, and palmately compound leaves (Fig. 3 and 4). Pinnately compound leaves are further divided into three sub types: pinnately, bipinnately, and tripinnately compound. Pinnately compound leaves contain a petiole and rachis, with leaflets attached to the rachis (Fig. 2). Bipinnately compound leaves (Fig. 3) are thought of as twice pinnate because they have a second order rachis (rachilla). Tripinnately compound leaves (Fig. 3) have a third order rachis.

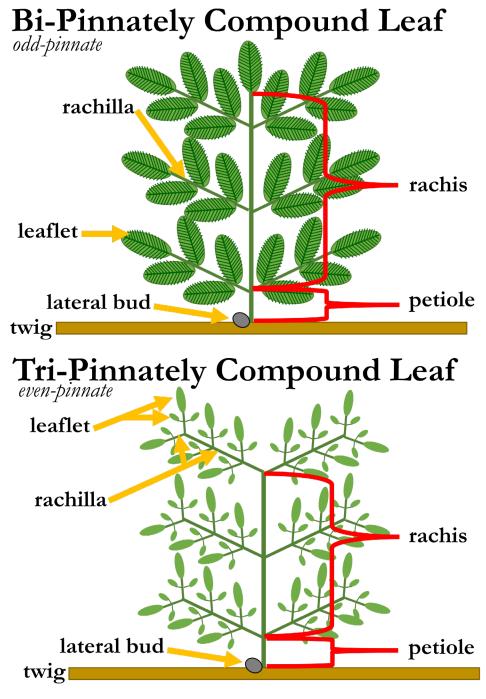


Figure 3: Diagrams of bi-pinnately and tri-pinnately compound leaves. The top diagram displays the second order rachis (rachilla) of a bi-pinnately compound leaf and notes the leaflets, petiole, rachis, twig, and location of the lateral bud. The bottom diagram displays a tri-pinnately compound leaf, noting the location of the second and third order rachis (rachilla), petiole, rachis, leaflets, lateral bud, and twig. Note that the top diagram has an odd number of leaflets (odd-pinnate) and the bottom diagram has an even number of leaflets (even-pinnate).

Trifoliate compound leaves have three leaflets (Fig. 4) that may or may not have an elongated rachis attaching the terminal leaflet. Poison-ivy and trifoliate orange are examples of plants with trifoliate compound leaves. Lastly, palmately compound leaflets radiate from one point at the top of the petiole (Fig. 4). Buckeyes are an example of a tree with palmately compound leaves.

For all compound leaves, the leaflets may connect directly to the rachis or have a leaflet stalk (petiolule) (Fig. 3 and 4). Odd-pinnate compound leaves have an odd number of leaflets (e.g., 5-23 leaflets) and even-pinnate indicates an even number of leaflets (e.g., 6-20 leaflets) (Fig. 3). Typically, odd-pinnate compound leaves have a terminal leaflet and even-pinnate compound leaves lack a terminal leaflet.

Palmately Compound Leaf petiolule leaflet petiole lateral bud twig Trifoliate Compound Leaf leaflet petiolule petiole lateral bud twig

Figure 4: Diagrams of trifoliate and palmately compound leaves, noting the leaflets, petiole, petiolule (if present), twig, and location of the lateral bud.

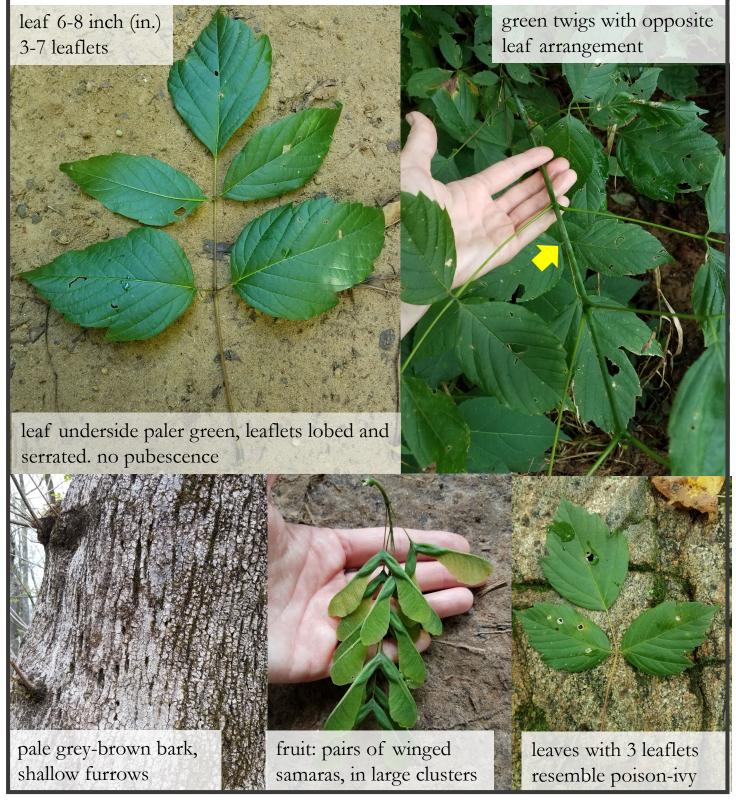
boxelder (Acer negundo)

FAMILY: Aceraceae

Form: multi-stemmed tree, up to 80 feet (ft.) tall

Where Found: moist sites, floodplains, found in mountains and Piedmont

<u>Leaf</u>: deciduous, odd pinnately compound, opposite leaf arrangement



smooth sumac (Rhus glabra)

FAMILY: Anacardiaceae

<u>Form</u>: multi-stemmed tree, often in clonal colonies, up to 20 ft. tall but usually 10-15 ft. tall <u>Where Found</u>: disturbed areas, full sun, roadsides, fields, fence rows, found statewide <u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



staghorn sumac (Rhus typhina)

FAMILY: Anacardiaceae

<u>Form</u>: multi-stemmed tree, often in clonal colonies, up to 25 ft. tall <u>Where Found</u>: disturbed areas, full sun, roadsides, fields, fence rows, found only in NE GA <u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



winged sumac (Rhus copallinum)

FAMILY: Anacardiaceae

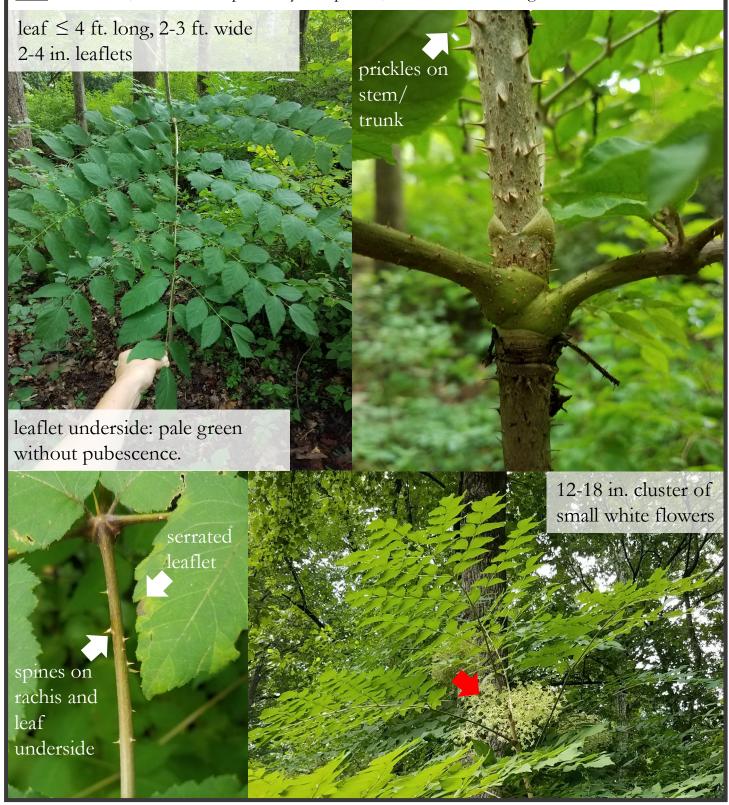
<u>Form</u>: multi-stemmed tree, often in clonal colonies, up to 25 ft. tall <u>Where Found</u>: disturbed areas, full sun, roadsides, fields, fence rows, found statewide <u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



devil's walkingstick (Aralia spinosa)

FAMILY: Araliaceae

<u>Form</u>: single-stemmed tree up to 30 ft. tall, often in clonal colonies of root suckers <u>Where Found</u>: typically, on moist soils nears streams and in bottomland forests, found statewide <u>Leaf</u>: deciduous, odd bi- or tripinnately compound, alternate leaf arrangement



black locust (Robinia pseudoacacia)

FAMILY: Fabaceae

Form: single-stemmed tree up to 90 ft. tall, but often only 40-60 ft. tall

Where Found: disturbed areas, moist to dry sites. Native to mountains, naturalized in Piedmont

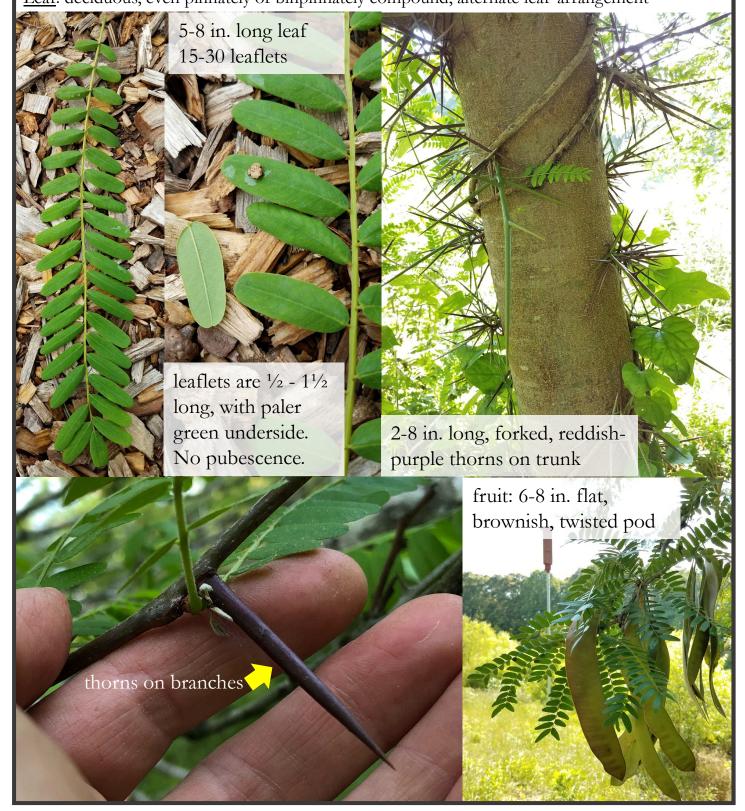
<u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



honeylocust (Gleditsia triacanthos)

FAMILY: Fabaceae

<u>Form</u>: multi-stemmed tree, up to 80 ft. tall, though usually shorter <u>Where Found</u>: floodplains to dry uplands, not native to Georgia but has naturalized in state <u>Leaf</u>: deciduous, even pinnately or binpinnately compound, alternate leaf arrangement



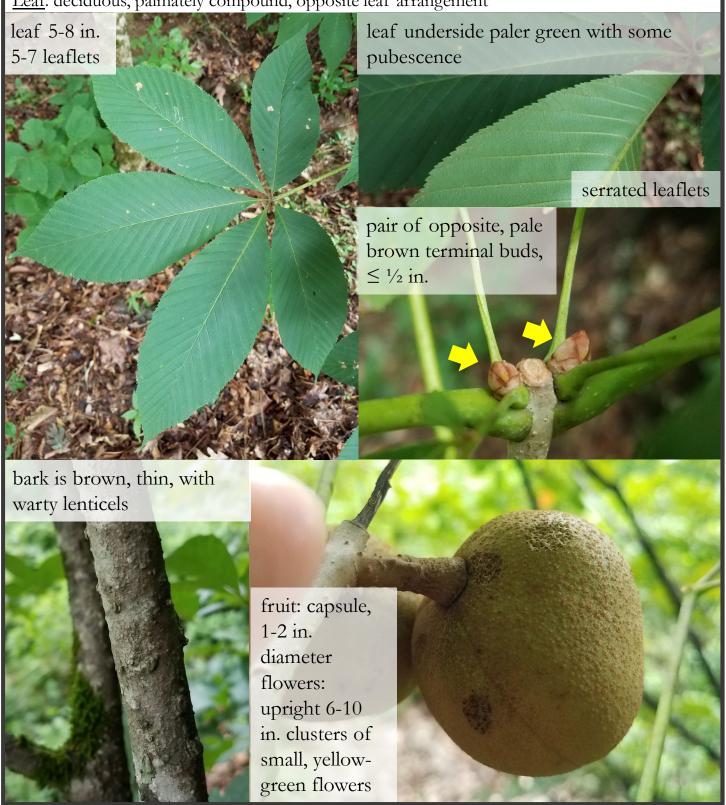
painted buckeye (Aesculus sylvatica)

FAMILY: Hippocastanaceae

Form: multi-stemmed tree, up to 25 ft. tall

Where Found: well-drained sites, slopes, open forests, found in the Piedmont

Leaf: deciduous, palmately compound, opposite leaf arrangement

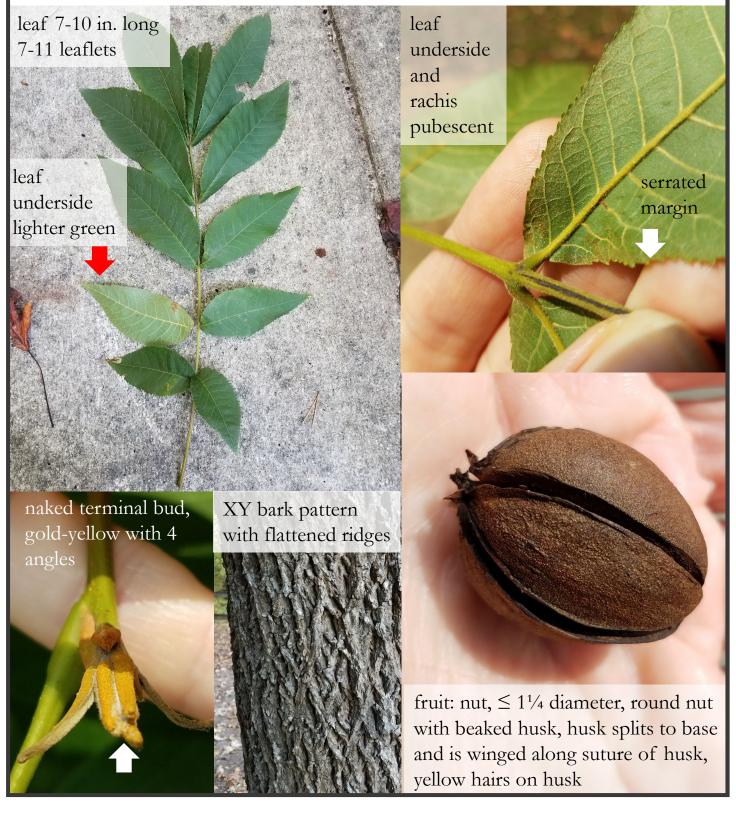


bitternut hickory (Carya cordiformis)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 100 ft. tall

<u>Where Found</u>: floodplains and moist soils, found throughout state except SE corner of state <u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



black walnut (Juglans nigra)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 100 ft. tall

Where Found: well-drained, moist sites, occasionally on floodplains, mountains and Piedmont



mockernut hickory (Carya tomentosa)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 90 ft. tall

Where Found: well-drained, upland sites, found statewide

<u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement

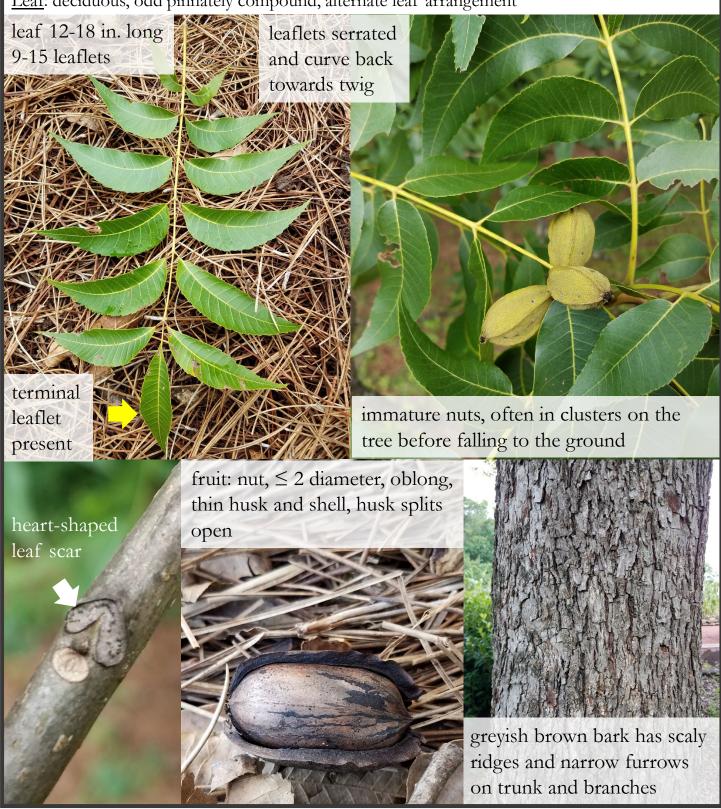


pecan (Carya illinoinensis)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 140 ft. tall

Where Found: not native to GA but has naturalized, prefers moist, rich soils, found statewide Leaf: deciduous, odd pinnately compound, alternate leaf arrangement



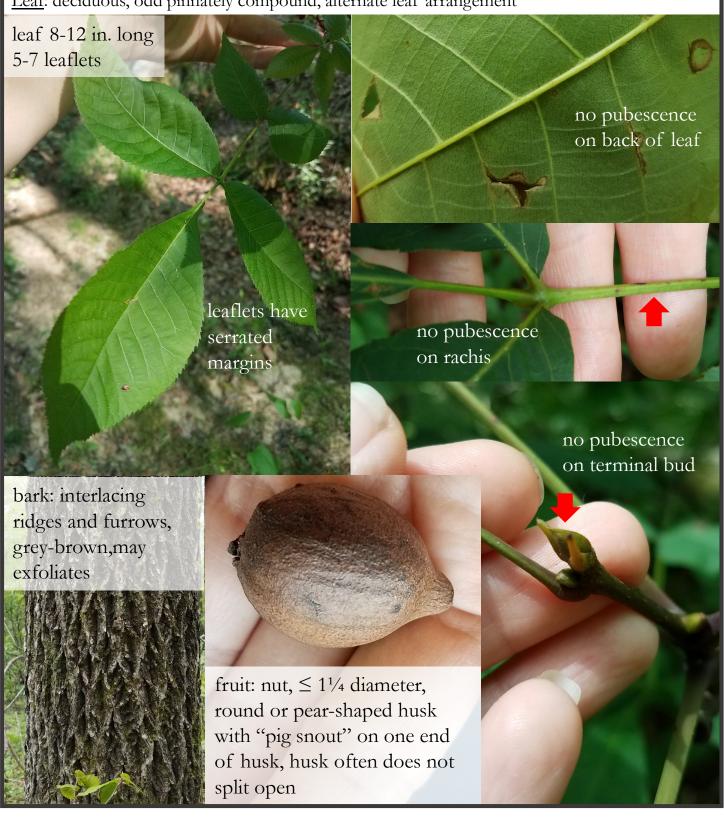
pignut hickory (Carya glabra)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 100 ft. tall

Where Found: upland, well-drained sites, found statewide

Leaf: deciduous, odd pinnately compound, alternate leaf arrangement



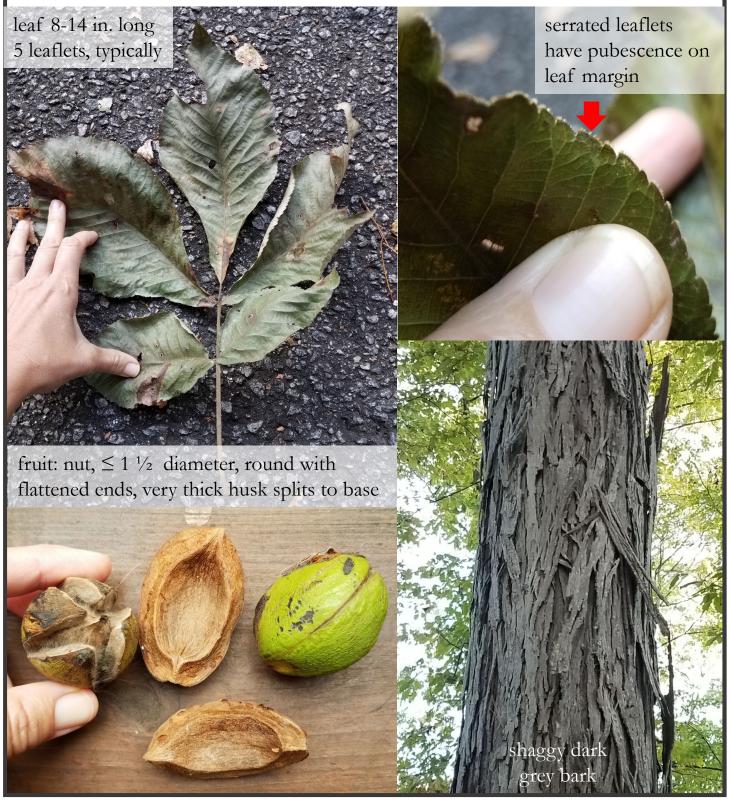
shagbark hickory (Carya ovata)

FAMILY: Juglandaceae

Form: single stemmed tree, up to 90 ft. tall

Where Found: floodplains or valleys. Occurs primarily in Piedmont and mountains

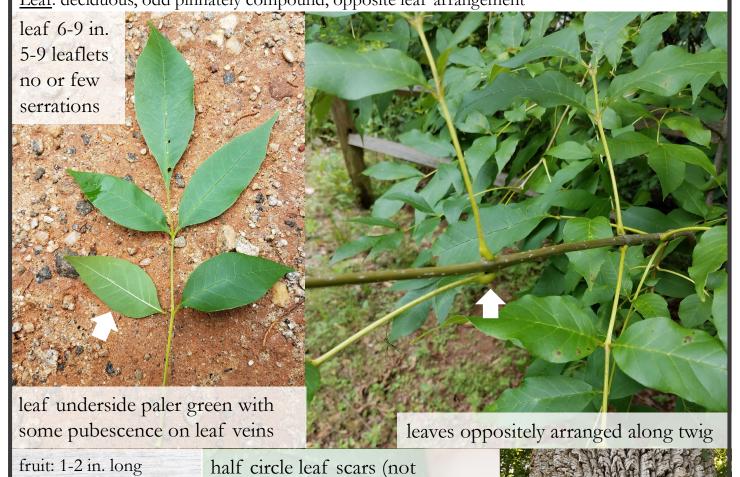
<u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement

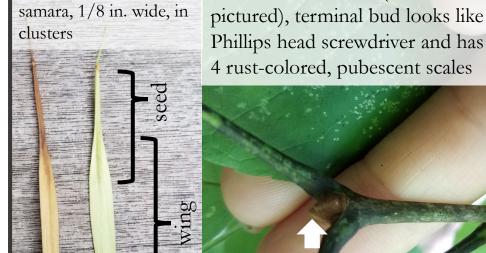


green ash (Fraxinus pennsylvanica)

FAMILY: Oleaceae

<u>Form</u>: single stemmed tree, up to 100 ft. tall, dioecious <u>Where Found</u>: well-drained, moist sites, floodplains and waterways, found statewide Leaf: deciduous, odd pinnately compound, opposite leaf arrangement





bark: pale grey or brown, blocky with narrow furrows or interlacing ridges

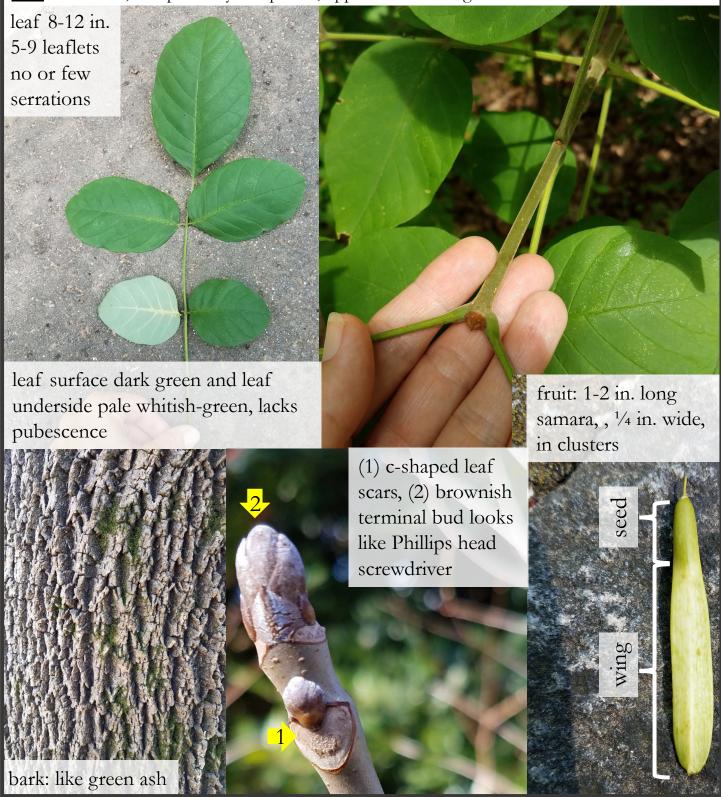
white ash (Fraxinus americana)

FAMILY: Oleaceae

Form: single stemmed tree, up to 80 ft. tall, dioecious

Where Found: well-drained, moist uplands sites, found in mountains, Piedmont, and SW GA

<u>Leaf</u>: deciduous, odd pinnately compound, opposite leaf arrangement



mountain ash (Sorbus americana)

FAMILY: Rosaceae

<u>Form</u>: single stemmed tree, up to 30 ft. tall, or multi-stemmed shrub <u>Where Found</u>: rocky upland sites, found at high elevations in the mountains <u>Leaf</u>: deciduous, odd pinnately compound, alternate leaf arrangement



Hercules' club (Zanthoxylum clava-herculis)

FAMILY: Rutaceae

<u>Form</u>: single stemmed tree, up to 30 ft. tall, or multi-stemmed shrub <u>Where Found</u>: sandy sites and maritime forests, primarily Coastal Plains (some Piedmont sites) Leaf: evergreen/tardily-deciduous, odd pinnately compound, alternate leaf arrangement



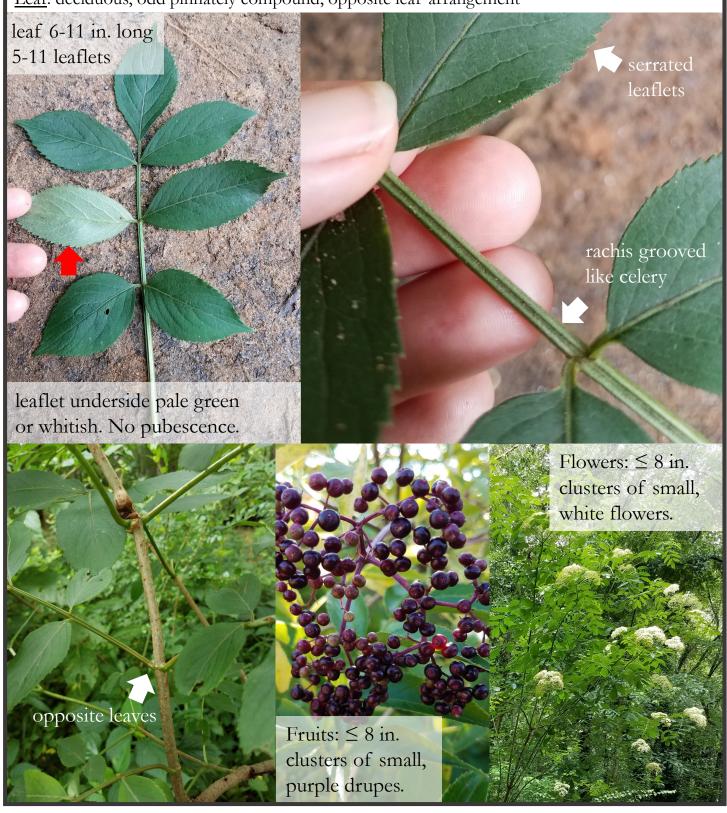
American elder (Sambucus canadensis)

FAMILY: Viburnaceae

Form: multi-stemmed shrubby tree, up to 12 ft. tall

Where Found: near water or moist areas, found statewide

Leaf: deciduous, odd pinnately compound, opposite leaf arrangement



Glossary

Blade- the broad portion of the leaf that is separate from the petiole.

Blocky- a type of bark with square-like raised bark protrusions.

Capsule- a type of (typically) dry fruits that split or burst open to release seeds.

<u>Chambered Pith</u>- the pith is the soft inner core of a twig. A chambered pith is when the interior portion of a twig has numerous chambers that run perpendicular to the length of the twig. Chambered piths are common in black walnut.

<u>Dioecious</u>- having male and female reproductive organs in separate individuals (e.g., male flowers and female flowers on separate trees).

Drupe- a fleshy fruit that surrounds a hardened pit, that contains a single seed.

Entire Leaf Margin-leaf margin lacking serrations or other protrusions.

<u>Furrow</u>- a channeled depression in bark, usually found between bark ridges. These can be thought of as valleys between bark ridges and vary in their width, length, and depth.

<u>Lateral Bud</u>- a bud that develops in the axil between a leaf petiole and a twig. Also called an axillary bud, these buds occur along the side of a twig.

<u>Lenticel</u>- a tissue on the bark of a woody plant that may resemble a raised circular or horizontal area. Lenticels allow the plant to exchange gases with the atmosphere.

Margin- edge of leaf blade or leaflet.

Node- the place where leaves, buds or branching twigs originate.

Petiole- the stalk that attaches the leaf blade to the stem.

Petiolule- the stalk of a leaflet.

Prickle- a coarse, spine-like growth from the plant stem's epidermis.

<u>Pubescence</u>- soft "down" or fine short "hairs" on the leaves and stems of plants Pubescence is a type of trichome. Trichomes are structures on the surface of a plant that serve a variety of functions and vary considerably in their shape.

Rachilla- a small or secondary rachis.

<u>Rachis</u>- an extension of the petiole of a compound leaf that bears the leaflets.

<u>Ridge</u>- a raised ridge-like projection on bark that often occurs between furrows. Ridges vary in length, width, color, and more.

Root Sprout- a stem that emerges from a root some distance from the tree. These sprouts are clones of the parent tree.

Samara- a type of fruit with flattened, fibrous wings.

Scaly- characteristic of bark that indicates flakiness.

Serration- saw-like appearance or a row of sharp or tooth-like projections on the edge of the leaf.

Spine- a modified leaf that is firm, slender, and sharp-pointed.

Stem- trunk of a tree (in the context of this publication).

Terminal Flowers, Fruits, and Buds-placement of these structures at the end of a twig or branch.

Thorn- modified shoots that are often sharp tipped and may be branched or unbranched.

References

Kirkman, K.L., Brown, C.L., & Leopold, D.J. (2007). *Native trees of the southeast*. Portland, Oregon: Timber Press. Seiler, J. & Peterson, J. (2022, December 9). *Virginia Tech dendrology fact sheets*. Retrieved from https://dendro.cnre.vt.edu/dendrology/factsheets.cfm

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