

**KEYS TO THE FLORA OF FLORIDA -- 27,
FRAXINUS (OLEACEAE)**

Daniel B. Ward

Department of Botany, University of Florida
Gainesville, Florida 32611, U.S.A.

ABSTRACT

Fraxinus (Oleaceae) is represented in Florida by 4 species. All are native; none is endemic. Habitat preferences are noted. The specific independence of *F. profunda* is supported. Variability of *F. caroliniana* is addressed, with recognition of var. *caroliniana*, var. *cubensis*, and var. *pauciflora*, comb. nov. An amplified key is given to the Florida taxa. *Phytologia* 93(1):63-72 (April 1, 2011).

KEY WORDS: *Fraxinus*, Oleaceae, Florida flora.

One might assume that within a genus such as *Fraxinus* (Oleaceae), the ashes, trees that are so familiar to so many, for so many years, and so important a component of the forest flora, there would remain no secrets or disagreements as to a simple matter of taxonomy: how many species are there in Florida? Not so! A much-followed floristic summary of the state by R. P. Wunderlin & B. F. Hansen (Guide to Vasc. Plants of Florida. 2003) admitted only 3 species. The only modern monograph of North American species, by Gertrude N. Miller (Agric. Exp. Sta., Ithaca, New York, Mem. 335. 1955), recognized 4 species within Florida, as did a careful nomenclatural compendium of American trees by E. L. Little (Checklist U.S. Trees, U.S. Dept. Agric. Handb. 541. 1979), and a detailed description of southeastern woody plants by R. K. Godfrey (Trees, Shrubs and Woody Vines. 1988). Some previous authors, J. K. Small (1903, 1933) and H. Kurz & R. K. Godfrey (Trees of Northern Florida. 1962) have distinguished 5 species within the state. Most recently, G. L. Nesom (pers. comm.) is preparing text for *Flora North America* that will delineate 6 species native to Florida. [Other significant studies: A key

to all U.S. species, by W. A. Dayton (J. Wash. Acad. Sci. 44: 385-390. 1954); a synopsis of southeastern species, by K. A. Wilson & C. E. Wood (J. Arnold Arbor. 40: 371-375. 1959); SEM leaf surface features, by J. W. Hardin & R. L. Beckmann (Brittonia 34: 129-140. 1982.)

The present treatment is atypical of this series in addressing so few species, and where photographs and keys to their identification are so readily available. But it is imperative that these important trees be understood as to the number of species that occur in the state and the characteristics by which they may be identified. And the perplexing variation within the *Fraxinus caroliniana* complex needs to be addressed. Long familiarity with the Florida ashes suggests that at least some of the remaining ambiguities may be resolved.

Fraxinus americana L., the White Ash, presents no problems, either in identification or nomenclature. It is quickly recognized by its samaras with chubby fruit-bodies and leaves that are whitish beneath. Even a leaf fragment can be identified without question: the whitish undersurface is closely set by discrete areas of minute rough-textured papillae, visible at 100X (Hardin & Beckmann, 1982). [Hardin & Beckmann reject "papillae," preferring "coronulate" as a more precise term.]

The slightly differing "Biltmore Ash," *Fraxinus biltmoreana* Beadle (= *F. americana* var. *biltmoreana* (Beadle) J. Wright ex Fern.), distinguished by its tomentulose leaves and twigs, seems not reliably reported south of Georgia.

Fraxinus pennsylvanica Marsh., the Green Ash ("Red Ash"), and *Fraxinus profunda* (Bush) Bush in Britt., the Pumpkin Ash, are closely related, but readily distinguished when samaras are present. The leaves, too, differ in size and pubescence, although not always convincingly so.

Though *Fraxinus profunda* clearly is a close relative of *F. pennsylvanica*, it is distinguished by a series of "gigas" characteristics. Miller (1955: 45-47) has tabulated 13 differences between the two

species, some subtle, others quite apparent. (Those most useful are employed in the accompanying key.) Differences between the Pumpkin Ash and the Green Ash have also been well described and illustrated by M. L. Fernald (*Rhodora* 40: 450-453, plates 528, 529. 1938). That these two taxa fully merit specific rank is attested to by most dendrologists with North Florida experience (Small, 1933; Fernald, 1950; Gleason, 1952; Miller, 1955; West & Arnold, 1956; Kurz & Godfrey, 1962; Little, 1979; Godfrey & Wooten, 1981; Clewell, 1985; Nesom, 2010; contra, Wunderlin, 1998). No justification for merger has been seen.

The origin of *Fraxinus profunda* has long stimulated debate and conjecture. One schooled in introductory genetics will not think it possible that a species may receive one-third of its genetic component from one parent and two-thirds from the other. Yet this ratio may describe the origin of the Pumpkin Ash. J. W. Wright (Morris Arbor. Bull. 8: 33-34. 1957; U.S. Dept. Agric. Handb. 271. 1965) has interpreted the Pumpkin Ash as a stable hexaploid derived from a diploid Green Ash and a tetraploid White Ash. The apparent discontinuous distribution of Pumpkin Ash, mapped as occurring separately in the upper Mississippi valley, the coastal Carolinas, and northern Florida (E. L. Little, U.S. Dept. Agric. misc. publ. 1342. 1977), has given credence to the suggestion that different populations of the Pumpkin Ash may have had independent origins. More detailed mapping (Nesom, *Phytoneuron* 2010-21: 1-6) shows a near-contiguous distribution of Pumpkin Ash from Maryland into South Carolina, a hiatus across Georgia, many stations in northern Florida, few in Alabama and eastern Mississippi, and an abundance from Louisiana northward [A Green Ash/White Ash origin, however, seems not to be supported by SEM epidermal structures (Hardin & Beckmann, 1982).]

The name *Fraxinus tomentosa* Michx. f., although earlier than the name *Fraxinus profunda* (1813 vs. 1897), has been demonstrated to be nomenclaturally superfluous (E. L. Little, *J. Wash. Acad. Sci.* 42: 369-380. 1952), and is thus illegitimate.

Fraxinus caroliniana Mill., the Pop Ash ("Carolina Ash"), is the only native ash that extends into the southern peninsula. Its often multi-trunked habit may permit easy recognition in the field even in the absence of its elliptic-winged samaras. But variability of the samaras fosters confusion in herbarium materials with *F. profunda*, while at times variability of the leaves suggests intergradation with *F. pennsylvanica*. [This variability is here treated as falling within three varieties.]

Habitats preferred by these four species are largely distinct. *Fraxinus americana*, as is widely recognized, is a species of mesic soils. *Fraxinus pennsylvanica* is found on lower sites, also mesic or sometimes seasonally swampy. *Fraxinus profunda* is truly hydric, restricted to stream-bottom swamps, especially those fed by springs. And *Fraxinus caroliniana* (with its varieties) grows on stream banks and among cypress (notably in the Fakahatchee Slough of Collier County, where it is often the dominant understory tree, well encrusted with epiphytic orchids and ferns).

The fidelity with which each of these species adheres to its preferred habitat is shown by a transect across the shallow valley of the Santa Fe River, a major tributary of the Suwannee River in the north-central Florida peninsula. [A convenient viewing point might be near Hornsby Run, a spring-fed stream north of High Springs, northwest corner of Alachua County.] The wooded uplands are of oaks, pignut hickory, sweetgum, Florida maple and other typical "hammock" trees of the upper peninsula. White Ash is present, although not in great numbers. Well down the slope toward the river the White Ash thins out and Green Ash appears; though the two species may at times occur together, the topographic gradient serves as a rather effective predictor of which species to anticipate. Small several-trunked trees of (typical) Pop Ash are scattered along the river's edge, never intruding among the Green Ash only slightly up-slope. And Pumpkin Ash is exclusively on the always-saturated muck soils of the wooded swamp bordering the spring run, with red maple and cypress. Though they are at times found only short distances from one another, the Pop Ash is not present deep within the spring-run swamps, nor the Pumpkin Ash on the

intermittently flooded-and-dry river banks. [*F. caroliniana* var. *pauciflora* occurs on muck soil of swamps and oft-submerged lake shores, and could perhaps be added to this transect.]

Maximum sizes of Florida ashes have been documented by a Florida champion tree survey (D. B. Ward & R. T. Ing, Big Trees, the Florida Register. 1997). Maximum heights recorded: Pumpkin Ash, to 100 ft.; White Ash, to 95 ft.; Green Ash, to 93 ft.; and Pop Ash, to 58 ft. Maximum circumferences recorded: White Ash, to 169 in.; Green Ash, to 123 in.; Pumpkin Ash, to 119 in.; and Pop Ash, to 56 in. Thus *Fraxinus americana*, *F. pennsylvanica*, and *F. profunda* are large trees, similar to one another in height and circumference (with *F. americana* perhaps of somewhat greater girth), while *F. caroliniana* is in both respects much the smaller.

From time to time individuals have been encountered that are intermediate in one or more characters between the recognized species of *Fraxinus*. Miller (1955) noted collections from North Carolina, seemingly of hybrids between the Pumpkin Ash and (apparently) White Ash. She found trees in New York that indicated an "interaction" between Pumpkin Ash and Green Ash. She (p. 25) discussed an early report (Sargent, 1902) of trees in Lake County [central peninsular] Florida that she tentatively interpreted as hybrids between *F. caroliniana* and *F. americana* (now identified as *F. caroliniana* var. *pauciflora*; see below). Trees that could confidently be identified as interspecific hybrids were not encountered in the present study. Hybridity, though it may well be present, is not considered a significant source of variability among the Florida ashes.

Fraxinus caroliniana, within itself, is the most variable of the Florida ashes. M. L. Fernald & B. G. Schubert (Rhodora 50: 186-190. 1948) and Fernald (Manual. 1950) attempted to understand the complex by describing 3 varieties: var. *caroliniana*, with samaras broadly oblong-oblancoelate to sub-elliptic, 1-2 cm. broad and 2-5-4.5 cm. long; var. *oblancoelata* (M. A. Curtis) Fern. & Schub., with samaras oblancoelate, 1.0-1.3 cm. broad and 3.5-5.5 cm. long; and var. *cubensis*

(Griseb.) Lingelsh., with samaras narrowly oblanceolate, 0.5-0.9 cm. broad and 3-5 cm. long. All were stated to occur in Florida.

These varieties of *Fraxinus caroliniana*, as delineated by Fernald & Schubert (1948), have not been recognized by later authors. Miller (1955) merely appended Fernald & Schubert's names to her synonymy, without reference in her text. Godfrey (1988: 511) did not go beyond noting the fruits of Pop Ash to be "very variable from plant to plant."

Though the taxa delineated by Fernald & Schubert are not acknowledged here, the present study, as well as a careful analysis by G. Nesom (Phytoneuron 2010-39: 1-13), suggests that recognition of entities within the *Fraxinus caroliniana* complex does permit assignment of nearly all individuals to a named taxon. Nesom argued that the complex consists of three entities, each of specific rank: *F. caroliniana* s.s., *F. cubensis*, and *F. pauciflora*. His *F. caroliniana* corresponds quite exactly with materials from the Carolinas, the type locality of the species. Nesom's *F. cubensis*, limited by him to central and south Florida (Fernald, 1950, suggested it reached Virginia), is readily recognized, at least in the southern peninsula, where in the absence of other ashes its samaras are quite consistent in size and form. Nesom strikes a chord of originality in recognizing Nuttall's long-sighted *F. pauciflora*, not only as the single Lake County population that had puzzled Miller (above), but as a frequent to common small tree with roughly the same North Florida range as his *F. caroliniana*.

Nesom's analysis goes far toward explaining the variation so long bedeviling *Fraxinus caroliniana*. It relies, however, on a character that cannot be seen with the naked eye, and indeed is scarcely visible at any magnification below 100X. This is the presence on the lower leaf surface of specimens he identified as *F. pauciflora* of a "micro-foveolate-papillose" appearance, with a "cuticular reticulum overlaying and obscuring the epidermal surface." In contrast, specimens he identified as *F. caroliniana* s.s. and *F. cubensis* lacked such an overlay and permitted stomata and other surface features to be seen.

In the field a quite different character has utility. This is the single-trunked habit of Nesom's *F. pauciflora*, and multi-trunked, often almost shrubby habit of *F. caroliniana* s.s. (Nesom, pers. comm., Aug 2010).

With this recognition of a population that perhaps may be reliably identified by the leaf surface character supported by the habit differences, and previous recognition of the South Florida population known as *F. cubensis*, as well as typical *F. caroliniana*, one is obligated to acknowledge these taxa at some level. The long history of competent observers having failed to note these differences is evidence that they are unremarkable, to say the least. The rank of species, as employed by Nesom, is believed to diminish the degree of clarity usually expected at such rank. Here, the rank of variety is seen as sufficient. Thus, the needed new combination is formed.

***Fraxinus caroliniana* Miller var. *pauciflora* (Nuttall) D. B. Ward, comb. et stat. nov.** Basionym: *Fraxinus pauciflora* Nuttall, N. Amer. Sylva 3: 61. 1849. TYPE: U.S.A. Georgia [Charlton Co.]: "in the neighborhood of Trader's Hill," William Baldwin s.n., no date (holotype: PH - fide Nesom, 2010).

The morphological differences believed most useful in separating the Florida species and varieties of *Fraxinus* are detailed in the accompanying key.

FRAXINUS L. Ashes ¹

1. Leaflets whitish beneath (the surface with small islets of minute white papillae, visible at 25X); leaf-scars deeply concave along upper edge; samaras with wing decurrent only on distal 1/3 of fruit-body; wing 5-10 mm. wide; fruit-body short and plump, 6-10 mm. long (length <8 times width), markedly thicker than adjacent wing. Large tree, to 30 m. Well-drained mesic hammocks. North Florida, south to upper peninsula (Citrus, Marion counties); frequent (rare or absent in w. panhandle and n.e. peninsula). Spring. [*Fraxinus Smallii* Britt.]

WHITE ASH.

***Fraxinus americana* L.**

1. Leaflets pale to medium green beneath (without minute papillae); leaf-scars slightly convex to concave along upper edge; samaras with wing decurrent to middle of fruit-body or beyond; fruit-body elongate and slender (length >10 times width), not appreciably thicker than surrounding wing.

2. Samaras 7-20 mm. wide, broadly elliptic to narrowly oblanceolate or spatulate; fruit-body 12-18 mm. long, its lateral edges indistinct; leaflets usually 5 (infreq. 3 or 7), 1.8-4.0 cm. broad, thin textured, glabrous beneath, variable in shape: broadly ovate, obtuse, serrate, to narrowly ovate, acute, entire; petiolules <1.0 cm. long. Shrub to mid-sized tree, to 20 m., often multi-trunked from base. Lake margins, river swamps. Spring.

POP ASH.

***Fraxinus caroliniana* Mill.**

- a. Samaras broadly elliptic to suborbicular (widest at midpoint), 10-20 mm. wide, lateral veins (each side) 12-20, the apex rounded; fruit-body >1/2 length of samara. Shrub or small multi-trunked tree. Panhandle (Escambia Co.), east through north Florida, south to upper peninsula (Levy, Alachua, Flagler counties); frequent. [Incl. var. *oblanceolata* (M. A. Curtis) Fern. & Schub.]

POP ASH (typical).

var. *caroliniana*

- a. Samaras oblanceolate or spatulate (widest above midpoint), 6-12 mm. wide, lateral veins (each side) 8-12, the apex rounded or acute; fruit-body \pm 1/2 length of samara.

- b. Lower surface of leaflets with a "cuticular reticulum," stomates obscured (at 100X); samaras oblanceolate (apex usually acute), 8-12 mm. wide. Small single-trunked tree. Panhandle, across north Florida, south to mid-peninsula (Orange, Osceola counties); common (infrequent in w. panhandle). [*Fraxinus pauciflora* Nutt.]
WATER ASH. var. **pauciflora** (Nutt.) D.B.Ward
- b. Lower surface of leaflets clear, stomates visible (at 100X); samaras narrowly oblanceolate to spatulate (apex often rounded), 6-10 mm. wide. Mid-sized multi-trunked tree. Upper peninsula (Citrus, Marion counties), to south peninsula (Collier, Monroe counties); frequent, at places (Fakahatchee) the dominant understory. The only native ash south of mid-peninsula. [*Fraxinus cubensis* Griseb.; *Fraxinus caroliniana* ssp. *cubensis* (Griseb.) Borhidi.]
CUBAN POP ASH. var. **cubensis** (Griseb.) Lingelsh.
2. Samaras 4-12 mm. wide, rhombic to narrowly spatulate or linear; fruit-body visibly distinct, slightly thicker than surrounding wing; leaflets usually 7 (infreq. 5), of uniform shape: broadly lanceolate, firm textured, acute to acuminate, entire.
3. Samaras 40-60 mm. long, narrowly rhombic to spatulate, 7-12 mm. wide, the upper margins straight or gently curved, apically rounded to truncate or emarginate; fruit-body 14-20 mm. long; leaflets 2.5-4.0 cm. broad, usually with a fringe of soft white hairs along sides of midvein beneath; petiolules mostly 1.2-2.0 cm. long. Large tree, to 30 m. Swamps, hydric hammocks, most often along spring-fed streams. Panhandle and north peninsula (south to Marion Co.); infrequent. Spring. [*Fraxinus pennsylvanica* var. *profunda* (Bush) Sudw.; *Fraxinus tomentosa* Michx. f.]
PUMPKIN ASH. **Fraxinus profunda** (Bush) Bush in Britt.

3. Samaras 30-40 mm. long, nearly linear, 4-8 mm. wide, the upper margins straight, apically rounded to acute; fruit-body 8-16 mm. long; leaflets 1.8-3.0 cm. broad, glabrous or with scattered fine hairs beneath; petiolules mostly 0.5-1.5 cm. long. Large tree, to 30 m. Low mesic hammocks. Panhandle to upper peninsula (Citrus, Sumter, Brevard counties); infrequent. Spring.
GREEN ASH. ***Fraxinus pennsylvanica* Marsh.**

¹ This paper is a continuation of a series begun in 1977. The "amplified key" format employed here is designed to present in compact form the basic morphological framework of a conventional dichotomous key, as well as data on habitat, range, and frequency. Amplified keys are being prepared for all genera of the Florida vascular flora; the present series is restricted to genera where a new combination is required or a special situation merits extended discussion.

Fraxinus has long been of interest to Florida botanists. Florida specimens were carefully examined in 1964 by Susan Elam Ruiz (FLAS), then in 1979 by Walter S. Judd (FLAS); their measurements and annotations have been of value to the present study. My long-time friend, Robert Godfrey (FSU), agonized with me over the characteristics separating the different taxa (as well as their number, as witnessed by his recognition of 5 species in 1962, reduced to 4 in 1988). Guy L. Nesom and I have repeatedly exchanged copies of our *Fraxinus* manuscripts, to my benefit.