Taxonomy & Identification: Redbay (*Persea borbonia*)

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Part 1 -- Redbay Taxonomy

At the edge of streams, springs, and swamps hides the redbay tree. Redbay (*Persea borbonia*), with its evergreen aromatic leathery leaves, dark blue fruit hanging on into winter, and reddish bark is a jewel among trees. The Native Americans found a host of medicinal uses for this medium sized tree. Early European Americans found the fine grained, highly polished wood to be perfect trim for bay boats and sailing ships. Southern gumbos require redbay leaf flavoring to be authentic. Now exotic pests threaten this unique American tree. This publication is to assist people understand the great variability and confusion regarding redbay taxonomy, its lineage, where it grows, and its identifying characteristics.

Scientific Name Choices

The scientific name for redbay is *Persea borbonia*. Redbay was first clearly identified in 1739 and taken for plant collections. Redbay has had a number of different scientific names over the years. The genus and this species have many overlapping descriptions with various other species, varieties and forms, leading to taxonomic confusion. The genus name *Persea* was first used in 1601 and is a Greek derived name for a "Persian tree with fruit growing from its stem." Over the years, this genus has been called many things including *Persea* (1601), *Laurus* (1731), *Borbonia* (1760), *Farnesia* (1763), *Menestrata* (1835), *Tamala* (1838), and *Nothaphoebe* (1898).

Other early scientific names for redbay included *Laurus caroliniensis* (1731), *Laurus borbonia* (1753), *Laurus axillaris* (1789), *Laurus elongata* (1796), *Borbonia caroliniensis* (1825), *Persea caroliniensis* (1836), *Tamala borbonia* (1838), *Tamala caroliniensis* (1838), *Nothaphoebe borbonica* (1898), *Persea littoralis* (1903), *Tamala littoralis* (1913), *Borbonia borbonia* (1922), and *Borbonia littoralis* (1922). All of these scientific names were describing the same tree species concept we now call *Persea borbonia*.

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Lumping or Splitting?

Because of variability in tree characteristics over its range, a number of varieties and forms of redbay have been identified over the years. Some experts have described this variability as multiple species and some have described this variability as varieties of a single species. It is clear there are a number of types of redbay in the southern and southeastern United States. The easiest way in the field to differentiate the types of redbay is either through the flower / fruit stem length, or through the hairs (tricombes) on the leaf undersides. Five unique variations have been described over many years.

The first type of redbay variation was first identified in 1814 (*Laurus caroliniensis* var. *glabra* (1814), *Persea caroliniensis* var. *glabriuscula* (1864), and *Persea caroliniensis* for. *glabriuscula* (1889)). This was a slight variation of redbay which was found in isolated pockets at the northeastern portion of the species range and had leaf undersides with few or no tricombes.

Swampy

The second type of redbay variation was widespread and also first identified in 1814 (swampbay -- *Laurus caroliniensis* var. *pubescens* (1814), *Tamala palustris* (1838), *Persea caroliniensis* var. *palustris* (1860), *Persea caroliniensis* var. *pubescens* (1864), *Persea caroliniensis* for. *pubescens* (1889), *Persea palustris* (1895), *Persea pubescens* (1895), *Tamala pubescens* (1913), *Persea borbonia* for. *pubescens* (1945), and *Persea borbonia* var. *pubescens* (1979). This variation of redbay was significantly different than standard redbay by having dense, long, kinked leaf tricombes and very long flower / fruit stems. This variation grew in more poorly drained swampy areas across the general range of redbay but tended to be concentrated in the more northern or cooler portions of the redbay range.

Silky

The third type of redbay variation was first identified in 1895 (silkbay -- *Persea humilis* (1895) and *Borbonia humilis* (1922)). This variation was found in Florida and Texas scrub lands and had dense, silky tricombes on leaf backsides. The fourth type of redbay variation was first identified in 1903 (*Persea littoralis* (1903), *Tamala littoralis* (1913), and *Borbonia littoralis* (1922)). This was a slight variation or ecotype of redbay found on coastal dunes in Florida. The fifth type of redbay variation was identified in 1942 (*Persea palustris* var. *laevifolia)* as a slightly different Virginia type of swampbay with few tricombes on leaves.

Summing Variations

The standard type of redbay is sometimes called *Persea borbonia* var. *borbonia* to differentiate the main species description from later described species, varieties, and forms. In most modern texts they will list either three separate varieties or three species for *Persea* in the south and southeastern United States. The varieties are listed as: the medium sized standard tree *Persea borbonia* var. *borbonia* (1753) -- redbay; the dwarf tree or shrub *Persea borbonia* var. *humilis* (1895) -- silkbay; or, the small tree *Persea borbonia* var. *pubescens* (1814) – swamp bay. Some experts accept the varieties as separate species: *Persea borbonia* -- redbay; *Persea humilis* -- silkbay; and, *Persea palustris* – swampbay. Here I will accept these three variations as separate species and the rest of this publication will concentrate on the standard redbay. Note Table 1 for differentiating these three *Persea* sp.

Common Names

The common names of redbay are many and as varied as the different places its grows. Redbay has been called bullbay, red bay, redbay, redbay persea, scrubbay, shorebay, swamp bay, swampbay persea, swampbay, sweet bay, sweetbay, and tisswood. Because of the variation in redbay's appearance, many names have been applied to the variations in this species. The term "bay" attached at the end of any name can be included as a one word name or separated out in two words (i.e. redbay = red bay). For common names, local preference determines which one is used and how it is spelled.

Table 1: Differentiating the primary species of *Persea* in the southern and southeastern United States using growing conditions, tree range, lower leaf tricombes, and flower / fruit stem length.

Persea palustris

swampbay – small tree (up to 30 feet tall and 15 inches in diameter)

- common from Virginia to Texas
- poor drained sites and wetland sites
- leaf more leathery and thick, 2-8 inches long, and elongated
- more leaf gall resistant than redbay
- twigs densely hairy
- tending to be in the northern or cooler part of the traditional redbay range
- tricombes stand erect, are very long and bent, and reddish brown in color
- tricombes are dense and providing a shaggy rough texture
- tricombes very dense along leaf mid-rib
- flower stalks much longer than leaf petioles

Persea humilis

silkbay – dwarf tree or shrub (up to 15 feet tall)

- found in Florida and Texas scrub lands only
- dry sites
- more black colored bark
- leaf thin and small (1-3.5 inches long and 0.4-1.2 inches wide
- tricombes lay flat, are ½ the length of swampbay and are very fine straight hairs
- tricombes are dense, with a shiny, silky smooth, light brown appearance
- flowers much later than redbay by a month or more
- flower / fruit stem short

Persea borbonia

redbay – medium sized tree (up to 60 feet tall and 2.5 feet in diameter)

- found from North Carolina around to Texas on lower coastal plain
- well drained but wet sites
- leaf leathery and thick
- tricombes lay flat, and are short, straight hairs with shiny golden-brown color
- tricombes are sparsely scattered to moderately dense
- flower stalks same length or smaller than leaf petioles

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Can You Say *Persea*?

Persea species occur in the Western Hemisphere, plus one species in the Canary Islands. The total count of *Persea* in the Western hemisphere is approximately 81 species and 18 varieties for a total of 99 types. Most of these types are tropical and sub-tropical trees primarily in South and Central America. *Persea* is divided into two groups (or sub-genera). One group is the (*Persea*) *Eriodaphne* or redbay group containing most of the species. The second group is the *(Persea*) *Persea* or avocado group which includes six species or varieties. There is a great deal of overlap in all the species concepts for *Persea*.

Probably the most recognizable member of the *Persea* genus is *Persea americana* the avocado from Central America. *Persea americana* var. *americana* is the avocado in grocery stores and *Persea americana* var. *drymifolia* is the Mexican avocado of true ethic cuisine.

Scented Family

Redbay belongs to the plant order *Ranales*, one of the most primitive groups of angiosperms (historically called the Magnoliids). This ancient group includes the magnolias, yellow poplars, pawpaws, anise tree, wild cinnamon, and the laurels, along with a few others.

Redbay is in the laurel family *(Lauraceae*, sub-family *Lauroideae*, tribe *Perseeae*). The laurel family contains about 46 genera and about 2,500 species, mostly concentrated in tropical and subtropical parts of Central America, South America, and east Asia. The laurel family trees contain many commercial aromatic oils like anise, linaloa, sassafras, cinnamon, and camphor. A number of the trees have dark or unique heartwood and are used in cabinetry.

US Relatives

Redbay's laurel family relatives include about 29 genera just in the Western hemisphere. The United States has roughly five native trees, two naturalized trees, four native shrubs, and one native herbaceous vine in the laurel family. These United States laurel family genera include: *Cassyth, Cinnamomum, Laurus, Licaria, Lindera, Litsea, Misanteca, Nectandra, Ocotea, Sassafras,* and *Umbellularia* (Western US). Of the laurel family trees, four are native to the southern and southeastern United States.

Critical to health concerns in this family are the five southern and southeastern species closely related to *Persea* which could harbor, or be susceptible, to similar pest problems. These local close relatives are: *Sassafras albidum* of the central and southern hardwoods; *Lindera benzoin* the northern spicebush; *Lindera melissaefolium* an endangered species of the coastal plain; *Litsea aestivalis* from the coastal plain; and, *Persea americana* the commercially cultivated avocado which has escaped cultivation in places.

Part 2 -- Redbay Range & Requirements

Confusion Ranges

Because of the confusion of species and varieties within native *Persia* in the southern and southeastern United Sates (especially between redbay and swampbay), identifying a species range can be a problem. Redbay is a tree of the Coastal plain growing roughly from the mouth of the Chesapeake Bay area south to the Florida Keys and west to the eastern Gulf area of Texas with a gap within its range in Louisiana across the Mississippi River valley. Redbay is at the northern edge of this large tropical / subtropical genus. Genetically redbay's closest relative is the Cuban shrub *Persea hypoleuca.*

The range of redbay is also confused due to differences among several taxonomic authors, with some sources being used for regulatory ranges. The literature lists five variations for the range of redbay, variously listing redbay growing in 8, 9, 11, 12, or 14 different states plus the Bahamas. Some suggest the Bahamas population is actually swampbay, not redbay. In addition, redbay is cultivated and has potentially escaped in Hawaii, Puerto Rico, and the Virgin Islands. Historically, it is believed redbay barely survived being driven into the Gulf and extinction during glacial periods, while it colonized farther north in-between the ice periods.

Geographic Range

The core range for redbay always listed by all sources include Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. Far southeast Virginia is usually listed as having a significant area of redbay. The Arkansas, New Jersey, and Oklahoma outlying populations are now extinct. A small area in far southern Delaware is identified, as are several small pockets in southeastern Maryland, as having redbay. Maryland lists redbay as a state endangered species. (Note Figure 1 – range map of redbay)

Redbay can be found along the Coastal Plain of the Atlantic and Gulf coasts. Redbay grows to about 400 feet altitude above sea level. Redbay grows in heat zones 9 to 12 along the southern Gulf coast and 7 to 11 along the southeastern Atlantic coast. Hardiness zones of minimum cold temperature are between 8 and 11. Hardiness zone 7B is sometimes listed, but represents a hardiness zone range expansion placed for ornamental purposes. Redbay does not have a strong cold resistance process and requires winter temperatures to stay above 29^{o}F / -2^{o}C.

Locations

Redbay grows as single stems or in thickets along streams and on high spots along swamp edges and hammocks. The further upslope from wet, non-flooded conditions, the less chance of redbay growing and surviving. Redbay survives and thrives in a variety of wet and well-drained conditions, as well as a wide range of light conditions. Generally, redbay requires partial sun to full sun with plenty of water and root oxygen for best growth. One of the myths surrounding redbay is its growth in "swamps." Actually redbays grow in bayheads where fresh water flows out of a spring or seep, but flows or drains away. Redbays require plenty of water and plenty of root oxygen, which makes limited drainage and anaerobic soil conditions damaging to the tree. Redbay grows at the edges of wet areas on the warm coastal plain of the southern and southeastern United States.

Requirements

Compared with other native trees, redbay has a medium growth rate and a medium life span. Redbay seeds germinate and seedlings grow well in mucky acidic soils, but it transplants and grows well in upland areas, including urban sites which are more moist and well-drained than most. As general rules: 1) the richer and more well protected the site, the taller the redbay; 2) the more water available and the more well-drained the site, the taller the redbay; 3) the farther inland and the higher altitude above sea level, the shorter the redbay; and, 4) the more droughty and well-drained the site, the shorter the redbay. Redbay is moderately tolerant of salt and intolerant of fire.

Mature redbay stems can be severely damaged and scarred by fire. Redbay is a late successional species which thrives on sites with little or no disturbance, especially from fire, site disruption, or soil compaction. Due to its crown form, evergreen leaves, foliage density, stand stocking, and the essential oils in leaves, fire can be devastating in redbay areas. On the other hand, fire does help stimulate seed germination. Prescribing cool winter burns every 4-6 years can minimize fire injury to mature trees and maintain good browse for wildlife.

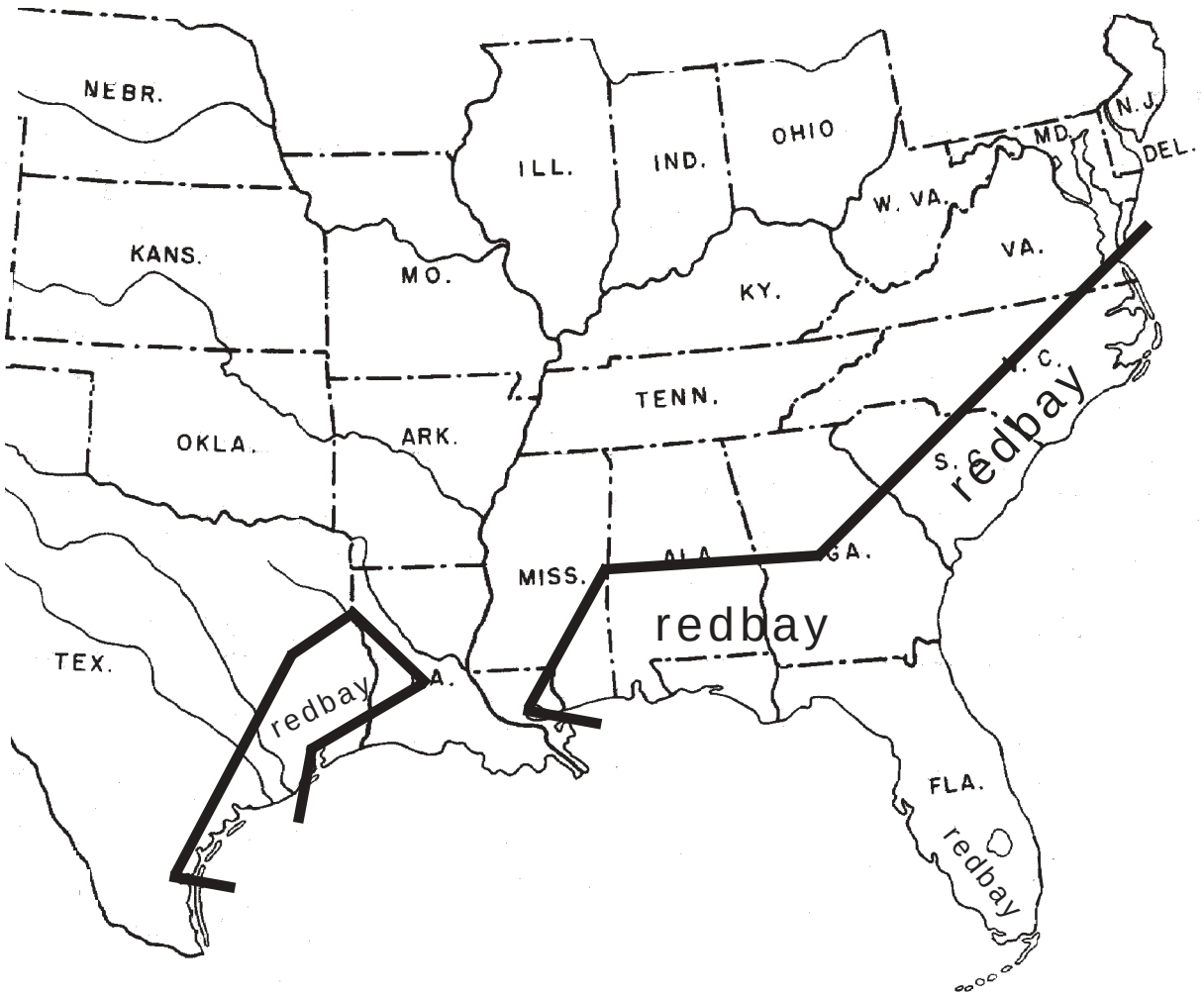

Figure 1: General geographic range map for redbay (*Persea borbonia*).

Small outlying populations are omitted. Areas within, and south & east, of the lines are redbay range, extending south to the Keys. Note the ranges for other native *Persea* species are found within redbay's range.

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Part 3 -- Identifying Redbay

Redbay, and associated species and varieties, have many highly variable characteristics which have caused some major historical and modern misidentifications.

Tree Size

Redbay can be expected to reach approximately 45 feet in height on average sites. A maximum of about 75 feet in tree height is possible. An average stem diameter (dbh) is considered 1 to 2.5 feet, with 4 feet in diameter maximum. Crown width is wildly variable due to site and light interference. An average crown width gathered from multiple sources is 32 feet in diameter with a maximum of 70 feet in diameter. One of the largest redbays ever measured is in Florida and has reached a size of 77 feet tall, 48 inches in stem diameter, and 52 feet in crown diameter.

Natural Form

The natural form of redbay is noticeably different than many other trees. The crown is oval to round shaped with densely packed single layers of foliage held on slender but stiff twigs. Redbay holds branches low to the ground and does not self-prune lower limbs well. In the understory of a forest it tends to form a crooked, muti-stem shrub. With small gaps in the canopy from overstory tree failures, redbay can slowly attain single stem tree form.

Leaves

Redbay leaves are simple with an entire, smooth margin which is slightly curled under. The leaves are thick, leathery, evergreen, and fall from the tree after 1.5 to 2 years, usually in early summer. When crushed the leaves have a aromatic spicy fragrance (like a kitchen "bay" leaf). The leaves are elongated-elliptical to wide-oval in shape, tapered at each end. On average the leaves measure 3 to 6 inches long and 1 to 2 inches wide.

Redbay leaves are bright, smooth, shiny and a medium green color on top. The leaf underside is paler due to a scattered covering of minute golden to brown colored shiny hairs (tricombes) and a pale grayish-white surface coating. The leaf tricombes lay flat along the leaf surface, and are straight and unbranched. The leaf mid-rib on the underside is reddish-orange in color. The leaves tends to develop a more yellowish tint in the cooler and more northern portions of its range. Redbay leaves are held on 0.5 to 1.0 inch long petioles. The petioles are stiff with a v-shaped groove running along the upper side. Petioles are reddish-brown in color and covered with minute tricombes. Note Table 1 for identification of different *Persea* species.

Flowers

Redbay is monoecious with perfect flowers (both male and female parts in the same flower). Redbay is usually not self-fertile, requiring cross-pollination for viable seeds. The flowers are small, about 1/8 to 1/4 inch long. They are not showy, nor usually noticeable, among the leaves. The flowers are a pale creamy white to pale yellow in color. The flowers are tiny and bell-shaped with no petals. They are held on short flower stalks which are about the same length or shorter than the leaf stalks (petioles). The flowers grow from the leaf bases (axils) in loose groups of several flowers. Redbay flowers in mid-May to June. Bees and wind are cited as the primary pollinators for redbay.

Fruit

Redbay fruiting occurs every year in October. The fruit is a small, round to oval, single seeded, shiny, dark blue to very deep purple colored drupe. Average fruit size is 0.5 to 0.9 inches long. The fruit has a thin, bitter tasting flesh which hangs on the tree into winter. Fused flower parts are visible at the base of the fruit as a six-lobed, green colored, persistent receptacle. The fruit stem is no longer than the leaf petioles and is reddish to orange-yellow in color. The single seed inside the fruit is round with a slight point. Inside the seed are red

cotyledons. Seeds should be sown as soon as gathered after the first of October. Germination occurs under wet (not flooded), mucky or wet organic litter conditions. Seed passage through animals (small birds, quail, turkey, bear and deer) stimulates germination.

Twigs & Buds

Redbay has slender, somewhat looping, stiff twigs. The twigs densely fill in gaps within the leaf canopy. The twigs are green when young, aging to a light brown color. The lateral buds are small and round with two outer bud scales densely covered with tricombes. The twig has elliptical leaf scars, a single linear bundle scar, and no stipule scars. Tricombes on the twigs are sparse. The twig has a terminal bud about 0.25 inches long which is densely covered with red tricombes. The twig pith is large -- about ½ the twig diameter -- white colored, square to round in cross section, and solid – not diaphragmed or chambered.

Branches

Redbay branches droop with age. They are poor self-pruners even when hanging dead on the tree stem. The branches are stiff, stout, and wide spreading. Branch unions are notoriously weak and fail easily in wind storms when the tree is in an exposed location. Proper training and mature tree pruning helps control some storm branch damage. The branch order number is controlled by active twig shedding. Twig shedding, along with shedding of fruits and evergreen leaves, make redbay messy from a litter standpoint.

Roots

Redbay roots have a high oxygen demand and are stressed by approaching anaerobic soil conditions. They contain an antibiotic compound (borbonol) which acts as an anti-root-pathogen material to protect roots. Borbonol has been shown to be a defense against *Phytophthora* root rots. The roots have a yellowish tint and are thick. They can be found growing far from the main stem near the soil surface under the litter layer. Moving young understory redbay wildlings can be difficult unless they are root-pruned first.

Bark

Redbay bark in its native form can be showy. Bark color can range from dark reddish brown to grayish brown. The bark texture is furrowed with shallow, irregular ridges expanding into scales with old age. Bark thickness is relatively thin (0.5 inches thick). On the younger bark of twigs there are scattered, golden-reddish colored, fine hairs (tricombes) laying against the surface which fall off with age. A number of other organisms growing on the bark can discolor or darken the bark. Sooty molds can make the bark black colored.

Part 4 -- Use of Redbay

Wood

Redbay has only limited local use as a wood material. The heartwood is red-colored, fine-grained, brittle, water resistant, works moderately well and polishes very well. It was traditionally used for tableware (like spoons), furniture pieces, boat and interior trim, and cabinets. It was gathered for boat trim in the live oak maritime forests during the live oak gathering days of the early sailing vessels.

Wildlife

Redbay fruit is consumed by many birds, including quail and turkey. Birds cited for eating and distributing redbay include bluebirds, mockingbirds, brown thrashers, fish crows, robins, and other seed-eating generalist songbirds. Because the fruit is held on the tree well into winter, it is a good winter food source. Rodents, like squirrels, also make use of the fruit. The tree as a whole is considered intermediate in palatability for browse, especially for deer and bear. New growth is especially susceptible to deer browse when other browse is limited. Redbay can periodically (every couple of years) be heavily grazed for short times with little long-term damage. Constant heavy grazing will kill redbay. The foliage is potentially poisonous to domestic grazing animals. Other animal users of note are three butterflies. Redbay is the host for the larvae of the palamedes (sometimes called laurel), Schaus' and spicebush swallowtail butterflies.

Food & Drug

Dried redbay leaves have been used for generations as the "real" Southern bay leaf for flavoring savory foods and considered essential for gumbo. Before European Americans, the Native Americans found great medicinal value in redbay. The Seminole and Creek nations used redbay for a number of purposes including treatment for: insanity (craziness), stiff neck, deep cough, drooling, numbness in limbs, arthritis, loss of appetite, nausea and vomiting, to cause vomiting, stomachache, dizziness, staggering, backache, fever and chills, headache, extreme thirst, constipation, diarrhea, blocked urine flow, frequent urination, abortion, eye problems, protracted labor, kidney problems, and unconsciousness. Redbay was also used to make a medicine given for grief, and redbay parts were used in funeral ceremonies.

Conclusions

Redbay is a botanical and cultural treasure growing on the edge of an ecological precipice. People of the southern and southeastern coasts of the United States have been blessed with redbay along wetland edges. Coastal development, forest land use changes, and new pests are driving redbay into more stressful conditions. This burial tree of Native Americans, this historic wood of polished trim for captain's cabins on Yankee clippers, and this special food for several rare butterflies is being pushed farther into oblivion. This unique species is now under attack from new pests which could destroy this old flavor of southern gumbo. Understanding how redbay grows and how to identify the tree may help to combat new threats as well as appreciate what we have always had but may have overlooked. Care is needed to sustain our redbays for the next generation.

Selected Redbay References

Brendemuehl, R.H. 1990. *Persea borbonia* / Redbay. Pages 503-506 in **Silvics of North America – Hardwoods** (volume 2). USDA-Forest Service Agricultural Handbook 654.

Brown, C.L. & L.K. Kirkman. 1990. Pages 139-141 in **Trees of Georgia and Adjacent States**. Timber Press, Portland, OR.

Coder, Kim D. 2006. Identifying Characteristics of Redbay (*Persea borbonia*). University of Georgia, Warnell School of Forestry and Natural Resources. Publication FOR06-4. Pp.5.

Coder, Kim D. 2006. Redbay (*Persea borbonia*): A Tree of Confusion. University of Georgia, Warnell School of Forestry and Natural Resources. Publication FOR06-3. Pp.6.

Coder, Kim D. 2006. Stress, Pests, and Injury in Redbay (*Persea borbonia*). University of Georgia,Warnell School of Forestry and Natural Resources. Publication FOR06-5. Pp.5.

Duncan, W.H. & M.B. Duncan. 1988. Pages 212-213 in **Trees of the Southeastern United States**. University of Georgia Press, Athens, GA. Pp.322.

Godfrey, R.K. 1988. Pages 413-417 in **Trees, Shrubs and Woody Vines of Northern Florida and Adjacent Georgia and Alabama.** University of Georgia Press, Athens, GA. Pp.734.

Godfrey, R.K. & J.W. Wooten. 1981. Pages 357-359 in **Aquatic and Wetland Plants of the Southeastern United States – Dicotyledons.** University of Georgia Press, Athens, GA. Pp.933.

Goodrum, P.D. 1977. Redbay / *Persea borbonia*. Pages 65-66 in L.K. Halls (editor) **Southern Fruit-producing Woody Plants Used by Wildlife.** USDA-Forest Service General Technical Report SO-16. Pp.235.

Hardin, J.W., D.J. Leopold, & F.M. White. 2001. Pages 259-260 in **Textbook of Dendrology** (9th edition). McGraw-Hill, New York. Pp.534.

Harrar, E.S. & J.G. Harrar. 1962. Pages 298-303 in **Guide to Southern Trees** (2nd edition). Dover Publications, NewYork.

Kopp, L.E. 1966. A taxonomic revision of the genus *Persea* in the Western Hemisphere. Memoirs of the New York Botanical Garden 14(1/March):1-120.

Little, E.L. 1979. Pages 183-184 in **Checklist of United States Trees**. USDA-Forest Service Agricultural Handbook 541.

Little, E.L. 1979. Four varietal transfers of United States trees. Phytologia 42(3/April):219-222.

Little, E.L. 1980. Pages 448-450 in **The Audubon Society Field Guide to North American Trees – Eastern Region**. Alfred A. Knopf, New York. Pp.714.

Radford, A.E., H.E. Ahles & C.R. Bell. 1968. Pages 476-478 in **Manual of the Vascular Flora of the Carolinas**. University of North Carolina Press, Chapel Hill, NC. Pp.1183.

Spongberg, S.A. 1975. *Lauraceae* hardy in temperate North America. Journal of the Arnold Arboretum 56(1):1-19.

Van der Werff, H. 1991. A key to the genera of *Lauraceae* in the new world. Annals of the Missouri Botanical Garden 78(2):377-387.

Wood, C.E. 1958. The genera of the woody *Ranales* in the southeastern United States. Journal of the Arnold Arboretum 39(3):296-346.

Wunderlin, R.P. 1998. Pages 307-309 in **A Guide to the Vascular Plants of Florida.** University of Florida Press, Gainesville, FL. Pp.806.