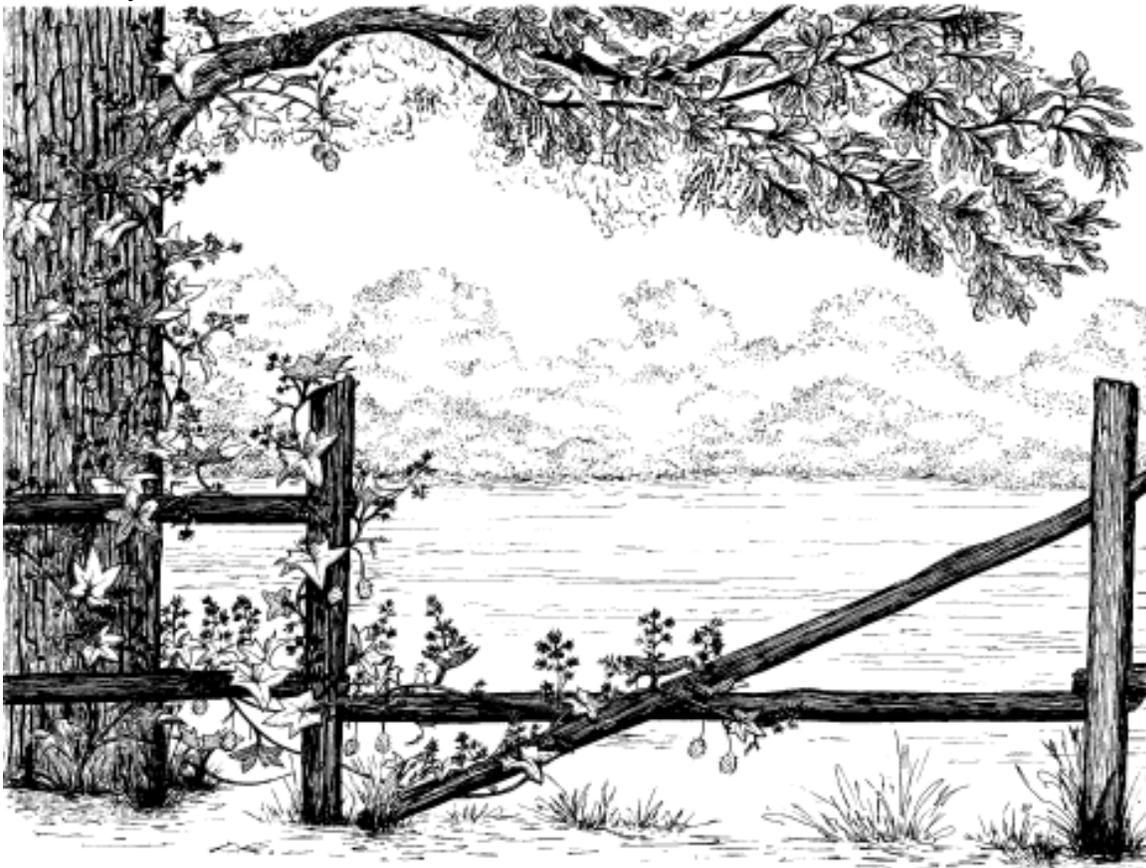


Magnoliids & other Primitive Angiosperms

Revised 5th of May 2015



Angiosperm, pl angiosperms; *Angiospermae* n (Greek *anggeion* (*angeion*), vessel, small container, & Greek *σπέρμα*, *sperma*, seed) A major division of the plant kingdom, commonly called flowering plants as their reproductive organs are in flowers, having seeds which develop in a closed ovary made of carpels, a very reduced gametophyte, & endosperm develop from a triple fusion nucleus; flowering plant producing seeds enclosed in a structure derived from the ovary; flowering plant, plants with ovules enclosed in ovary.

A division of the seed plants (spermatophytes) that bear ovules & seeds in closed megasporangia (carpels) in contrast to gymnosperms, which have exposed ovules & seeds, borne “naked” on the megasporophylls. Angiosperms are distinguished by a unique process of sexual reproduction called “double fertilization”. According to the number of leaves (cotyledons) present in the embryo, two major groups are distinguished, the Monocotyledons & the Dicotyledons. Angiosperms are commonly referred to as “flowering plants: even though the reproductive organs of some gymnosperms are also borne in structures that fulfill the definition of a flower. Cf gymnosperm.

Angiosperms have traditionally been split into monocotyledons & dicotyledons, or plants with one or two seed leaves respectively. One group of plants that have two seeds leaves was problematic, as it also had primitive flowers & some traits in common with monocots. This group is the Magnoliids, or primitive angiosperms. The remainder of the dicots are called Eudicots, the prefix eu-, from Greek εὖς, *eus*, good, meaning the good dicots.

Magnoliids (Eumagnoliids?)

About 8,500 (5,000-9,000) spp in 20 angiosperm families, of large trees, shrubs, vines, lianas, & herbs that are neither eudicotyledons nor monocotyledons, distributed in tropical & temperate areas. They are also referred to as primitive angiosperms, the primitiveness demonstrated by flowers that have fewer or less differentiated parts. Most spp have long, broad, net-veined leaves & large flowers, 3-merous, with numerous, spirally arranged tepals (perianth parts that are not differentiated into petals & sepals), stamens, & carpels, & pollen with a single pore (like the monocotyledons). Most have fused carpels, some also have leaf-like stamens & vesselless wood. Many have cells with ether-containing oils. The seeds have embryos with two cotyledons (like the eudicotyledons). The group is polyphyletic, or not sharing a common ancestor. They are sometimes split into woody magnoliids & paleoherbs. Woody magnoliids have large, often showy, bisexual flowers. Paleoherbs have small flowers with few parts, & they may be unisexual.

Magnoliids include many spp of economic importance, including avocados (*Persea americana*), guanabana, sour sop, cherimoya, & sweet sop (*Annona* spp), black & white pepper (*Piper nigrum*), bay leaves (*Laurus nigrus*), nutmeg (*Myristica fragrans*), cinnamon (*Cinnamomum verum*), camphor (*Cinnamomum camphora*), ornamentals (*Magnolia*) & lumber (*Liriodendron*). Other spp are known for narcotic, hallucinogenic, & paralytic properties. The hallucinogenic compound myristicin comes from the spice NUTMEG.

The Magnoliids include most, but not all, WATER LILIES. Like other intricate plants, WATER LILY nomenclature is the stuff of bad dreams.

The families include the following:

ANNONACEAE AL de Jussieu 1789 CUSTARD-APPLE FAMILY,
 ARISTOLOCHIACEAE AL de Jussieu 1789 BIRTHWORT FAMILY,
 CABOMBACEAE A Richard 1828 WATER-SHIELD FAMILY,
 CALYCANTHACEAE Lindley 1819 SWEET-SHRUB FAMILY,
 ILLICIACEAE AC Smith 1947 STAR-ANISE FAMILY,
 LAURACEAE AL de Jussieu 1789 LAUREL FAMILY,
 MAGNOLIACEAE AL de Jussieu 1789 MAGNOLIA FAMILY,
 NYMPHAEACEAE RA Salisbury 1805 WATER-LILY FAMILY,
 PIPERACEAE CA Agardh 1824 PEPPER FAMILY,
 SCHISANDRACEAE Blume 1830 STAR-VINE FAMILY, &
 SAURURACEAE E Meyer 1827 LIZARD'S-TAIL FAMILY,

TABLE OF CONTENTS

PRIMITIVE ANGIOSPERMS

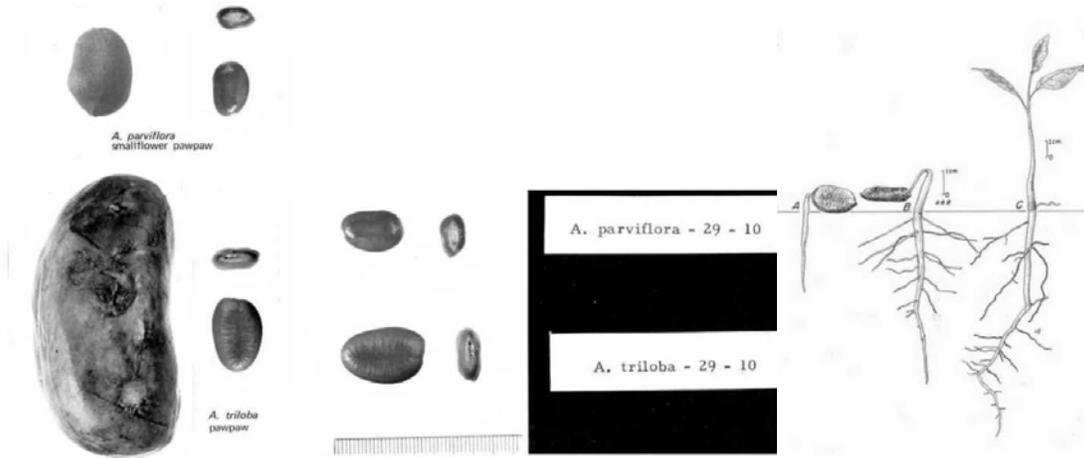
| | | | |
|------------------|------------------------------|--------------|--------------------------|
| ANNONACEAE | Asimina | NYMPHAEACEAE | Brasenia |
| ARISTOLOCHIACEAE | Asarum | | Castalia |
| CABOMACEAE | Brasenia | | Nelumbo |
| LAURACEAE | Lindera | | Nuphar |
| | Sassafras | | Nymphaea |
| MAGNOLIACEAE | Liriodendron | SAURURACEAE | Saururus |
| | Magnolia | | |

ANNONACEAE AL de Jussieu 1789 **Custard-apple Family, Anonads** A family of about 128 genera & about 2300 spp of trees, shrubs, & lianas, primarily tropical. *Anonaceae* in some older sources. The wood of *Annona glabra* fluoresces dull yellow under ultraviolet lights.

ASIMINA Adanson 1763 **Pawpaw** *Annonaceae Asimina (Assimina), Asiminum* (a-SI-mi-na or asim'ina)
 The name for *Asimina triloba*, New Latin, from the North American Indian name *assimin*, or from the French-

Indian name *assiminier*, from American French *assimine* papaw, modification of Illinois *rassimina*, from *rassi* divided lengthwise into equal parts & *mina* seeds. One source gives American Indian *assimin* through French *asiminier*, or a French-Canadian name *asiminier*, used by Adanson*. Eastern North American endemic genus of 8 spp of deciduous shrubs & small trees having aromatic alternate leaves & flowers with 3 to 15 stamens & carpels. Former genus names include *Uvaria* & *Porcelia*. The tropical papaya is *Carica papaya*. Several spp of *Asimina* are larval hosts for the Zebra Swallowtail Butterfly.

*Michel Adanson's, a French botanist of Scottish descent, naming style gave rise to the term an 'Adansonian name', or a name that has an unknown basis or little basis relative to the plant described.



Asimina spp.

Photos & line drawing courtesy of the US Forest Service USDA-NRCS PLANTS Database.

Asimina triloba (Linnaeus) Dunal *NJ, NY COMMON PAW-PAW, aka ASIMINA, ACIMINIER, BANANA TREE, BANANGO, CUSTARD APPLE, DOG BANANA, DOG-BANANA, FALSE BANANA, FETID-SHRUB, HOOSIER BANANA, INDIAN-BANANA, INDIANA BANANA, KANSAS BANANA, KENTUCKY BANANA, MICHIGAN BANANA, MISSOURI BANANA, OZARK BANANA, PAPAU, PAPAWE, PAW PAW, PAWPAW, PAWPAW APPLE, PAWPAWTREE, POSSUMHAW, PRAIRIE BANANA, POOR MAN'S BANANA, WEST VIRGINIA BANANA, (*trilobus -a -um* (tri-LOBus) with three lobes, from Latin *tri*, prefix from *tres*, three, & Late Latin *lobus*, husk, pod noun from Greek λοβος, *lobos*, lobe of the ear, liver, or lung, also a capsule or pod of a legume, in reference to the calyx, the outer most flower whorl) The common name probably came from the Arawakan name of *papaya* (or alternately from Spanish *papaya*), for the similarity of the fruits.

Habitat: Rich woods & alluvium, woods & thickets, wooded slopes, alluvial soils. Deciduous forests, on slopes of ravines, along streams, & floodplains. In the se USA, "Alluvial forests, other moist, nutrient-rich forests" (w12). In Michigan, deciduous forests, swamps, thickets along streams (rvw11).
distribution/range: Native from western New York & southwest Ontario to Iowa, south to Florida & east Texas. Its northern range may have been extended by Native Americans. In most Illinois cos except in the northern tier & northwest. It is rumored to grow in some sheltered coves in the upper reaches of Bureau Creek.



Culture: Propagation: By seed or bud graft. Fruit set is very low, 0.45%, compared to the number of flowers. Seeds usually 2-3 large, dark brown; remove from pulpy matrix. Delayed germination is caused by slowly permeable seedcoats & dormant embryos; seed from a southern source germinated 100% without cold treatment; three seed lots given 60 day cold stratification germinated 50, 62, & 82%; fall sowing untreated seed did not improve germination; dormant seeded seeds may germinate over a two year period; seedlings have a long taproot.

Fruits ripen late summer to fall. Collect fruits when they turn from green to yellow green and the seed coats are light brown. The fruits can be ripened indoors in a paper bag, but the overripe fruit develop an unpleasant odor. Seeds have a pulpy skin that can be removed by soaking in a bucket of water for a week. Code B seeds will germinate upon shifting to 70°F after 90 days of cold moist stratification at 40°F, and G chemical inhibitors, & * seeds are hydrophilic, intolerant of dry storage. Outdoor-planted seeds are subject to

small mammal granivory, best stratified in ziplock in a refrigerator. Cultivars are grafted onto seeding stock. Propagation from seed is the preferred method. (cu02)

Seed must have 90-120 days cold moist stratification in moist sphagnum at 34-40°F, overwinter filed planted seed. Germination is hypogeal, shoots emerge without cotyledons. Green house germination occurs in about 7 weeks, field planted seeds in following July or August. 10" taproot develops before shoots emerge. (crfg)

"Fruit often drops from tree while still hard, green & sour. These fruits can be stored in single layers on trays until pulp begins to soften. Remove seeds & air dry before storing. Trees are easily grown from scarified/stratified seed. Follow scarification with a 60-90 day stratification at 41 degrees. Fall sow in a shady location. Some sources say seed is the only method of propagation while other say increase is possible by root cuttings or layering." (lbj)

Can be grown from seed sown in fall in a cold frame or in pots of sandy soil in a heated greenhouse in winter, as well as by layering or root cuttings; best in well-drained, loamy soil in a sunny sheltered location; not easy to transplant. Medium growth rate.

Kew Royal Botanic Garden notes Storage Behaviour: Uncertain; Thousand Seed Weight: 810g; Dispersal: Animal; Oil content: 38.0%.

Cultivation: Hard to transplant, due to fleshy, brittle roots with few fine root hairs. Transplant from container grown seedlings after bud break. Provide good drainage & keep well watered. Prefers moist, fertile, slightly acidic soils. Avoid alkaline soil. Full sun, sp has some shade tolerance, but may become leggy in shade. Hardy in the north. Hardy to zones 5-9. Young plants are light sensitive (UV light cu02) & may need shading during the heat of the day for a year or two. A good understory tree. Low maintenance. In the home landscape, it is best planted along the property edges. Pruning tolerant, but remove only dead, damaged or wayward branches. The fruit can pose a litter problem.

Description: Native, large, deciduous, multi-stemmed, clonal shrub, or small, short-trunked tree, with tropical looking leaves; spreading branches form a rounded crown, medium to coarse texture; 15-20' (4.5-6.0 m) rarely up to 40' (12m), tall & equally as wide; starts as a single trunk, soon suckering; understory tree, medium texture; bark dark brown, thin, rough & scaly, warts, shallow irregular fissures, fecal odor, light brown twigs with maroon (rusty) hairs, buds are a cluster of very small rusty-pubescent leaves, buds naked, flattened, & often curved; wood light, soft, coarse grained, & weak; leaves tropical-looking, alternate, 4-8(-12)" long & 1.5-3(-6)" wide, slightly drooping, margins entire, dark green above, lighter green with maroon pubescence below, odorous when bruised, said to smell like 1) green bell peppers, 2) used motor oil, 3) an unpleasant odor, good yellow fall color; flowers cup-shaped, 3 green sepals, 6 purple petals in 2 tiers in June slightly before the leaves, on last years wood, flowers at first green, turning lurid purple (maroon), borne upside down singly in leaf axils, 2" across, somewhat showy, fetid or fragrant; followed by large greenish-yellow fruits (technically a berry), cylindric, oblong, 3.0-5.0" long & 1.0" or more in diameter, ripening to brown, pulp is edible, tastes like bananas; seeds ca the size & shape of a lima bean, brown to chestnut brown, 1.5-2.5 cm. key features: Naked terminal buds, 0.33" to 0.5" long; buds pubescent; naked superposed flower buds; alternate leaves; large fruit that taste like bananas; fecal odor to broken branch; suckers. "A distinctive shrub or small tree with very large ± obovate entire leaves, pawpaw has a large fleshy big-seeded fruit. The flowers appear before the leaves are expanded in late spring." (rvw11)

Comments: status: Endangered in New Jersey. Threatened in New York. phenology: Blooms in early May to June (February to May, depending on latitude) on old wood. Flowers emerge with the leaves. Fruit ripens July - September. Landscape uses, flowers interesting, naturalized plantings; for fruit production or as an ornamental specimen or street tree(?), or where clusters of small trees are wanted. The jury is out on the flowers, with reports of fragrance & fetidness. In the wild, PAWPAW is suited to regimes of moderate disturbance. Sp is probably tolerant of an occasional fire; it is top-killed but resprouts. Growth may be reduced for 10+ years. The sp was first recorded from the DeSoto expedition in the lower Mississippi valley in 1541.

Each flower contains several ovaries & may produce multiple fruits (up to 9 per cluster).

Flowers are perfect, with fully functional male & female parts. They are not self-pollinating. Flowers are protogynous, ie, the female stigma matures & is not receptive when the pollen is shed. PAWPAWS are also self-incompatible, requiring pollen from another genetic individual.

The wood fluoresces faint yellow-green under ultraviolet lights.

“In Illinois, the richest groves, interspersed though the prairies, are constituted mainly of the same kind of trees which indicate the best soils in the Western States, as ... pawpaw, (*Porcelia triloba*,)” *Asimina triloba* as *Porcelia triloba* (L.) Pers. (Short 1845).

Associates: The large, dark, odoriferous flowers are largely pollinated by flies. Also pollinated by nitidulid beetles. Attracts butterflies, game birds (esp quail). Songbirds & terrestrial furbearers (esp opossums, raccoons, fox, mice, *Homo sapiens*, & squirrels) eat fruit. Deer, goats, & rabbits will not eat the leaves or twigs. PAW-PAW is the only (?) larval host for *Eurytides Marcellus*, ZEBRA SWALLOWTAIL. Larval host for *Dolba hyloeus*, PAWPAW SPHINX. No serious pest problems.

Ethnobotany: PAWPAW is the tree with largest edible fruit native to the Americas (?). Fruits available about October. Ripen fruits outdoors as the fragrance is overpowering. Fruits have the flavor & consistency of bananas, & can be eaten raw, cooked, in puddings, or breads, or made into ice cream. When eaten raw, cut in half, scoop out the large brown seeds, & sprinkle with lemon juice. Native Americans ate the fruit fresh (*sans lemon*), as cakes & sauces, & dried for winter use. Fruit used for food by Iroquois (Waugh 1916). Bark fiber can be woven into rope or made into cloth, & was used for weaving bags by Menominee & Pottawatomie (Whitford 1941). Identified in Ohio rock shelter fabrics (Whitford 1941). Seeds are known from several archaeological sites in Ohio. Settlers made a yellow dye from the fruit & an insecticide from crushed seeds. Wood is light green, coarse grained, weak & commercially unimportant.

⚠ Handling the fruit may cause an allergic reaction in sensitive people. Contact dermatitis has been reported, but it can be mild & short term. The fruits can cause nausea & severe stomach & intestinal pain in some people. Seeds contain the alkaloid, asiminine, reported to have emetic properties or are reported to be toxic. With that in mind, the ingested seeds are said to have a calming effect. The bark also contains the alkaloid analobine, once used as a medicine. Leaves & twigs contain compounds with promising anti-cancer & pesticidal properties.

VHFS: [*Annona triloba* L., *A pendula* Salis, *Asimina glabra* Horta ex C Koch, *Orchidocarpum arietinum* Michx, *Porcelia triloba* (L) Pers, *Uvaria triloba* (L) Torr & Gray]

Horticultural cultivars or varieties. Many cultivars have been selected for improved fruit traits, but most are not readily available.

<http://www.crfg.org/pubs/ff/pawpaw.html>

J Sullivan, 1993. *Asimina triloba*. In: Fire Effects Information System, [Online]. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2011 May 22].





Line drawing courtesy of Kentucky Native Plant Society. Seed photo Steve Hurst USDA-NRCS PLANTS Database. Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image. Photos WD Brush - USDA-NRCS PLANTS Database - Not copyrighted images. Illinois map courtesy plants.usda.gov.

[BACK TO TOP](#)

ARISTOLOCHIACEAE AL de Jussieu 1789 **BIRTHWORT FAMILY** A family of about 6-12 genera & 600 spp of vines, shrubs, & herbs of tropical, subtropical & warm temperate regions.

Aristolochia sp PIPEVINE

Seeds ripe in the fall. Code B seeds will germinate upon shifting to 70°F after 90 days of cold moist stratification at 40°F. Pot up before seedlings become entangled. 2-3 node cuttings semi-hard new growth with short internodes and leaves trimmed by half and treated with 200 ppm IBA will root. (cu02)

Our two most valuable indigenous bitters *Eupatorium perfoliatum* and *Sabbatia angularis* are abundant, and *Aristolochia serpentaria* is seen occasionally in the groves, where various species of dogwoods (*Cornus*) are also of frequent occurrence.” *Aristolochia serpentaria* L. (Short 1845).

ASARUM Linnaeus ☠ **WILD GINGER, ASARET, GINGEMBRE SAUVAGE** *Aristolochiaceae Asarum* (a-SAH-rum) from the Latin & Greek names, or New Latin, from Latin, hazelwort, from Greek, ασαρων, *asaron*, a name used by Dioscorides, for *asarabacca*, a kind of nard. The flowers of *Asarum* are occasionally visited by mycotrophic flies (K L Lu 1982). In the broad sense, 10 spp of evergreen & deciduous acaulescent herbs with a relictual distribution in North America & Eurasia. X = 13. See the discussion under *Hexastylis* in Weakley (2012).

Seeds have a fleshy appendage. All parts of the plant contain volatile oils that have the odor of culinary ginger, *Zingiber officinale*, a tropical monocot. *Asarum* contains several poisonous compounds, & may cause dermatitis in sensitive people.

Asarum canadense & *europaeum*, sow at 22°C (71°F) for 6 wks or more. Move to -4 to +4°C (24-39°F) for 6-8 wks. Then raise the temperature to 10°C (50°F). If no germination in 4-6 wks, repeat the cycle from the beginning. If the warm/cold cycles were not long enough, a new warm/cold cycle is needed. (tchn)

Asarum canadense Linnaeus *ME WILD GINGER, aka AMERICAN WILD GINGER, *ASARET DU CANADA* (FC), *ASARO* (I, SP), CANADIAN SNAKEROOT, CANADIAN WILDGINGER, CANADIAN WILD-GINGER, *CANADISCHE SCHLANGENWURZ* (G), *GINGEMBRE SAUVAGE* (FC), *KANADENSISK HASSELÖRT* (SW), *KANADISCHE HASELWURZ* (G), *KANADISCHE SCHLANGENWURZEL*(G), *KOPYTEN KANADSKIJ* (R), *SERPENTAIRE DU CANADA* (FC), *SERPENTARIA* (SP), VERMONT SNAKEROOT, *Name'pin*, sturgeon plant (Ojibwa) (*canadensis* -is -e (kan-a-DEN-sis) of or from Canada or the north-east USA, of Canadian origin.)

Habitat: Rich woods & shaded calcareous ledges, floodplain woods & upland mesic woods. In Michigan, “Rich, moist deciduous forests, especially on banks, much less often in cedar swamps; very local or absent in the eastern Upper Peninsula & northern Lower Peninsula, elsewhere common”



(rvw11). In the se USA, "rich deciduous forests in circumneutral soils" (w12). distribution/range:
Culture: propagation: Seeds are hydrophilic. Harvest fruit before fully ripe. Fresh, washed, & cleaned seed should be sown immediately outside. Moderately difficult from seed. Code D seeds need a period of warm moist stratification followed by cold stratification and will germinate after shifting back to warm (70°-40°-70°), * seeds are hydrophilic, intolerant of dry storage, G chemical inhibitors. (cu00) In order to germinate, seeds need a warm, moist period followed by a cold, moist period. Plant fresh seed or keep moist. Refrigerate clean seed in a ziplock bag until planting or starting other treatment. (pm09) Sow seeds just below moist soil surface at 70°F for 6 weeks. Move to 30°F for 2 months, then bring back to 50°F. (ew11)

Kew Royal Botanic Garden notes Storage Behaviour: not determined; Thousand Seed Weight: 4.581-13.21g; Dispersal: diaspore is carried intentionally; the seed had an eliasome; Oil content: ?%.

70,400 (ew11, aes12) seeds per pound.

asexual propagation: Best divided early. Easy by division in late spring or early fall.

cultivation: Space plants 9-12. The plants are strongly determinate & put out only one set of leaves each year. Sp is best in rich, mesic soils that do not dry out. Clay soil tolerant. Optimum pH 5.5-6.5. Consistently moist but well-drained, organic soils. Tolerates moderate drought. In favorable sites, WILD GINGER spreads quickly.

bottom line: Plant fresh-picked seed, or dormant seed with seed that has been stored in a ziplock in a refrigerator. Extant overstory only! Germ 0.0%. Dorm 97%. Test 29 days.**

Description: Polymorphic sp; up to 5.0" tall; 2 broad, heart-shaped leaves; flowers purplish brown (green/brown) jug-like shape, no true petals; typical variety has spreading calyx lobes mostly 1-2 cm long with attenuate tips up to 1.5 cm long; N 2n = 26.

Comments: status: Threatened in Maine. phenology: Blooms April to May. Seeds mature early summer. Grown for foliage & ground cover. Plant some close to a path where the interesting flowers can be easily observed.

Associates: The dull-red flowers resemble rotting flesh have evolved to attract small flies (& possibly ground dwelling beetles), but WILD GINGER is now largely self-pollinating. It is possible the flies are extinct, or they have not migrated north with the plants after the Wisconsinan glaciation. WILD GINGER is an alternate larval food source for *Battus philenor* PIPEVINE SWALLOWTAIL BUTTERFLY & may be extending the butterfly's range north of *Aristolochia* DUTCHMAN'S PIPEVINE. (cu00)

Ants harvest the seeds. This genus is said to be subject to walnut wilt, caused by juglone, & it is recommended to not plant within 60 feet of a walnut, butternut, or hickory tree. But, contrary to the powers that be, it is somewhat walnut tolerant. Our colony is under black walnuts, but has persisted with a decade+ of neglect. Ignorance can be bliss. The colony is open & much dispersed; a pair of leaves here, a pair there, & so on. It is not a ground cover but interstitial in our BLACK WALNUT woods.

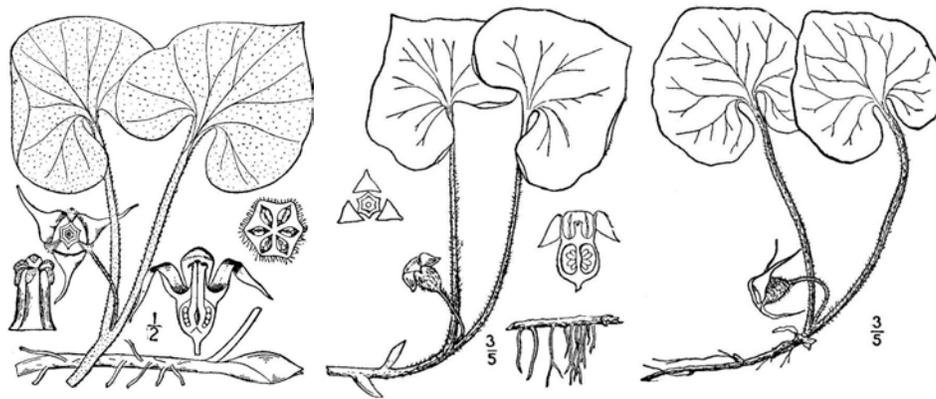
Ethnobotany: Roots are available in spring & summer. Root was used by Ojibwa, Pottawatomie, & Sauk-Fox for flavoring (Yarnell 1964). Also used for food & medicine but not reported for beverage. Root used for food by Ojibwa (den28). Used as medicinal beverage Ojibwa & Pottawatomie (sm32, 23). Plant was used as a contraceptive & to treat broken bones. Used for indigestion by Ojibwa (den28). Also used utility plant (den28). Rhizomes & roots are a carminative agent & a flavoring. The plant is cultivated for its essential oils, & is used medicinally for coughs, asthma, chills, & rheumatic disorders. Extracts from the leaves & stems are said to possess antibacterial activities.

VHFS: In addition to the sp, also known from Chicagoland are var *reflexem* (EP Bicknell) BL Rob, var *ambiguum* (EP Bicknell) Farw, var *acuminata* Ashe.

[*Asarum acuminatum* (Ashe) EP Bicknell, *A canadense* L var *acuminatum* Ashe, *A canadense* L var *acuminatum* Ashe f *prattii* Fassett, *A canadense* L var *ambiguum* (EP Bicknell) Farw, *Asarum canadense* L f *canadense*, *A canadense* L var *canadense*, *Asarum canadense* var *obtusum* Muhl, *Asarum canadense* f *phelpsi* Fernald, *Asarum canadense* f *prattii* Fassett, *A canadense* L var *reflexum* (EP Bicknell) BL Rob, *A reflexum* EP Bicknell, *A reflexum* EP Bicknell var *ambiguum* EP Bicknell, *A rubrocinctum* Peattie]

"*A acuminatum* (Ashe) Bickn. WILD GINGER This replaces the next to some extent in this latitude but it is probably the less common. It is likely to be found in deep ravines, on densely wooded slopes, & on shaded limestone outcrops. The "dells of Hall Creek, Page Forest on Kent Creek & the "north" & "south ledges" of Kinnikinnick Creek." (ewf55)

"*A reflexum* Bickn. More generally distributed than the preceding not being uncommon in mesophytic woods." (ewf55)



Asarum canadense

Line drawings courtesy of Kentucky Native Plant Society, line drawings as *A. canadense*, *A. reflexum*, & *A. acuminatum*. Seed photo Steve Hurst USDA-NRCS PLANTS Database. Not copyrighted image.

[BACK TO TOP](#)

CABOMBACEAE A Richard 1828 **WATER-SHIELD FAMILY** A family of 2 genera & about 6 spp of perennial aquatic herbs from rhizomes in mud (2 spp in northern north America), nearly cosmopolitan. Family is closely related to the *Nymphaeaceae* & may be best combined with it in the broad sense. The fruits are achenelike or folliclelike, leathery, indehiscent; seeds 1-3, aril absent; endosperm sparse; perisperm abundant; embryo minute; cotyledons 2, fleshy (Wiersema fna). Some *Cabomba* spp are cultivated for aquaria. **Move**

[Brasenia here.](#)

[BACK TO TOP](#)

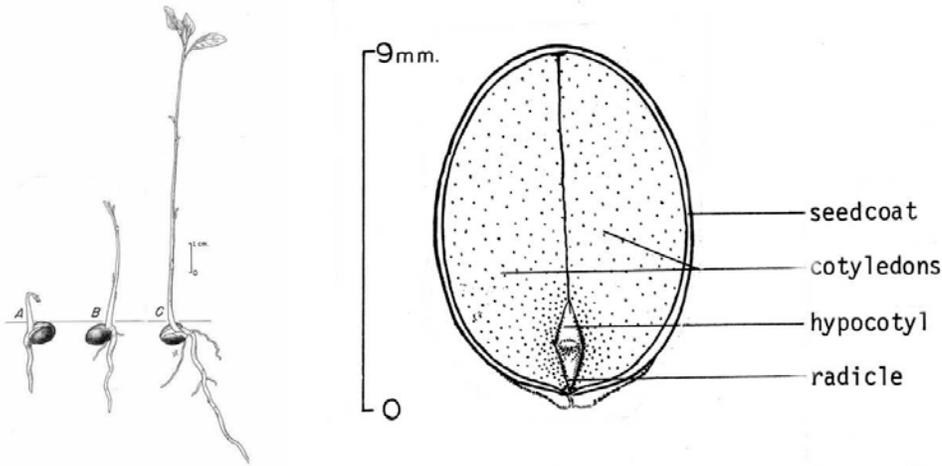
CALYCANTHACEAE Lindley 1819 Sweet-shrub Family

Calycanthus Linnaeus 1759 Sweet-shrub

Seeds ripen fall. Code A seeds will germinate within 4 weeks sown at 70°F, or B seeds will germinate upon shifting to 70°F after 90 days of cold moist stratification at 40°F (cu00).

LAURACEAE AL de Jussieu 1789 **LAUREL FAMILY** *Lauraceae* Laura'ceae (lore-AY-see-ee) plants of the Laurel family, from the genus name, *Laurus*, & -aceae, the standardized Latin suffix of plant family names, from *laurus*, *lauri* f, *laurus*, *laurus* f, laurel or bay tree, or its foliage, sprig, or branches. LAUREL is from French *laurier* for *lorier*, with the common substitution of *l* for a second *r* in a word. A family of about 50 genera & 200-300 (2500-3500) spp of pantropical trees & shrubs, with some spp of subtropical, & warm temperate regions. Fruits are drupes. CULINARY BAY & CINNAMON are produced from spp in this family.

LINDERA Thunberg 1783 **SPICEBUSH, BENZOIN** *Lauraceae* *Lindera* (LIN-de-ra) After Swedish botanist Johann Linder (1676-1723). A genus of about 100 spp of deciduous shrubs or trees, mostly of tropical & temperate Asia, Australia, & 3 spp in North America. Fruit is a drupe. X = 12.



Seedling drawing LH - USDA-NRCS PLANTS Database - Not copyrighted image. Seed cross section courtesy of the US Forest Service USDA-NRCS PLANTS Database.

Lindera benzoin (Linnaeus) Blume *ME SPICE BUSH, aka BENJAMIN BUSH, FEVERBUSH, *FEVERBUSKE* (SW), *FIEBERSTRAUCH* (G), *LAURIER FAUX-BENJOIN* (FC), NORTHERN SPICEBUSH, WILD ALLSPICE, (*benzoin* (BEN-zo-in) a dry, brittle, aromatic resin from *Styrax benzoin*, of Java, from **lo-benzo*i, **lo-benju*y, from Arabic *lubān jāwī*, meaning the frankincense of Jāwā (Sumatra). The *lo-* appears to have been dropped as if it were the article (see *azureus*). In English, originally *benjoin*, which was corrupted to BENJAMIN. (OED)) SPICEBUSH is a reference to the aromatic leaves. In some areas, this is called “FORSYTHIA OF THE WILDS” for the profusion of yellow flowers held tightly against the branches resembling the cultivated FORSYTHIA.

Habitat: Damp woods, brooksides, & rich moist woods. Streambanks, rich moist woodlands, along streams. “Stream banks, low woods, margins of wetlands; uplands, especially with exposed limestone; 0-1200 m” (Wofford fna). In Michigan, “moist rich deciduous forests & swamps, rarely under cedar northward” (rvw11). In the se USA, “rich alluvial forests, mesic forests on slopes with circumneutral soils, bottomlands, swamps. Where occurring on upland slopes, *L benzoin* is an excellent indicator of base-rich soils, generally derived from calcareous sedimentary rocks or mafic metamorphic or igneous rocks.” (w12) distribution/range:



Culture: SPICEBUSH fruit ripens in August or September. The seed loses viability soon after maturity, but storage at low temperatures may prolong viability.

SPICEBUSH fruit is collected in September & October. The seeds are processed by maceration & flotation. “The seeds apparently do not store well, but a low temperature is helpful in maintaining viability.” Embryos are dormant & respond to warm moist stratification for 30 days followed by cold moist stratification for 90 days. Germination tests are conducted in moist sand or peat at 25° C or 20/30° C. Recommended practice is to fall sow, mulch, & remove the mulch in the spring. Cold moist stratified seed can be spring planted. Germination ranges from 70% to 80%. (yy92)

Seeds are cleaned in a Dybvig separator to remove the flesh & pulp, & cleaned to about 99% purity. Seeds are kept slightly moist until sowing. Germination is about 25%. Sow seed outdoors & use natural stratification to overcome any dormancy. Seeds require a warm-cold stratification regime to germinate. Sowing in the fall permits seed to undergo warm stratification prior to winter. Hand-sowing seed in outdoor nursery beds in rows in October. Seeds are dusted with fungicide & hand sown into rows (rows are 5 to 6 inches apart, seeds are spaced 0.25” apart in rows). Endomycorrhizae are sprinkled over the seed before covering with about 0.25-0.50” of soil. The beds are then mulched with aged sawdust. Sawdust mulch is scraped back in spring prior to seedling emergence. Seedlings generally emerge the spring following sowing. Newly emerged seedlings are monitored closely for irrigation needs. Young seedlings are shaded as soon as they emerge with poly screening at 30%. Shade cloth remains over seedlings until mid-August. (Davis & Kujawski 2001)

A common deciduous understory shrub found in the eastern US, which grows best on moist peaty or sandy sites with pH of 4.5-6.0. Seed was easily found & collected on upland cove hardwood sites in northern New Jersey.

Fruits ripen September thru October. The 0.50" x 0.25" green fruit turns bright red at maturity. However, ripe fruit is sought after by birds. Within one week of leaf drop, birds can claim all fruit, thus it is best to time collection prior to leaf fall. Macerate with water, then float off pulp & empty seed; follow with sun drying. Fall seeding into raised beds of sandy loam at rate of 2.1 g/sq ft. Transplants are bare-root. Weed control is by hand; irrigation schedule is 1 inch biweekly. Pre-planting treatment is 120 days of stratification at 41°F. Seeds lose viability soon after maturity, but viability can be prolonged with low temperature storage. (Skaradek 2001)

Germination studies have used: 1) 30 days warm moist stratification followed by 90 days cold moist stratification, & 2) 105 days cold moist stratification. Nursery practice is to fall sow & mulch or spring sow cold moist stratification seed. 90 days cold moist stratification resulted in 85 - 90 % germination. (dh87) Requires WC (Deno's notation for maceration with detergent washes). Dry storage for 6 months fatal. Germination is best in warm moist stratification 70°F. (07%) - cold moist stratification 40°F. - warm moist stratification 70°F. (21%). "The low germination is mainly due to the high percentage of seeds that rot in 1 - 3 weeks after encountering moisture. This is another example where much of the seed seems to be internally infected with rotting organisms." (nd91)

"Collect seeds in late summer through October when the fruit has turned red. Seeds must be cleaned before storing. Store seeds in moist sand or sow immediately. Seeds allowed to dry out lose viability. Stratify for 90-120 days at 41°F. Some texts say double stratification (a month of warm stratification followed by 3 months of cool stratification) is necessary." (lbj)

Kew Royal Botanic Garden notes Storage Behaviour: uncertain, "Seeds apparently do not store well at room temperature, but a low temperature is helpful in maintaining viability (yy92)"; Thousand Seed Weight: 103.0 average per g (80.85-141.8/g); Dispersal: diaspore is eaten intentionally, seed ingested or regurgitated; diaspore = fruit (a drupaceous berry), fruit is fleshy/juicy.

3,176 (usda; 7000/kg); 4,500 (usda); 75,008 (jfn04) seeds per pound.

This sp' seed is storage sensitive & should be planted as soon as reasonable after harvest.

cultivation: Difficult to transplant, slow to establish, others say fast growing. Tolerates clay soil, with one source noting a preference for clay soils. Full sun to partial shade, tolerant of a lot of shade, but fall color is best in full sun. Planting with some sunlight results in better form, more berries, & better fall color. Zones 4-9. Hardy to zone 2? Generally a low maintenance plant. The male & female flowers are on separate plants, so you must plant several for fruit production.

Description: Dense, many branched, deciduous, native shrub, 6-12(-15)' tall, with 6-12' spread, in sunny sites, more open habit in shade; green glossy foliage with gray hint, very aromatic when crushed; excellent yellow fall color; greenish yellow, apetalous flowers in early spring, with branches covered with bright glossy, fleshy red 0.33" fruit (drupes) in early fall, 0.38" long, oval; n 2n = 24. key features: "Flowers in nearly sessile clusters from last years nodes appearing before the leaves; aromatic twigs, leaves, flowers, & fruits; red drupes; leaves & young branchlets glabrous." (Ilpin)

Comments: status: Special Concern in Maine. phenology: Blooms 3-5. Harvest fruit 8-9. C3. Recalcitrant seeds. The showy & sweetly fragrant flowers appear before the leaves. The male flowers are larger & showier than the females. Good fall golden-yellow leaf color, & showy red, berry-like fruit are visible after leaf fall.

Used in specimen plantings, shrub borders, open woodland gardens, moist areas along stream & pond edges,

Associates: SPICEBUSH is a larval host of *Callosamia promethea* PROMETHEA SILKMOTH, *Papilio troilus* SPICEBUSH SWALLOWTAIL BUTTERFLY, & *Papilio glaucus* EASTERN TIGER SWALLOWTAIL BUTTERFLY.

Flowers attract butterflies & other beneficial insects. Upland gamebirds (esp quail & pheasant) & songbirds (esp. wood thrushes & veeries) eat fruit. Sp has few serious diseases or pests.

Ethnobotany: Tea can be made from the aromatic leaves & twigs. Leaves & twigs available from spring to autumn. Used by Chippewa for flavoring & beverage. Used as medicinally by Cherokee, Creek, Iroquois, Ojibwa & Rappahannock. (Harris 1891, Gilmore 1933, Moerman 1986).

VHFS: In Britton & Brown (1913), this is *Benzoin aestivale*. [*Laurus benzoin* Linnaeus, Sp Pl 1: 370. 1753; *Benzoin aestivale* (L) Nees; *Laurus benzoin* L (basionym), *Lindera benzoin* Meisn, *L benzoin* (L) Blume, *L benzoin* var *aestivalis* (L) Meisn, *L benzoin* f *benzoin*, *L benzoin* var *benzoin*, *L benzoin* var *pubescens* (EJ Palmer & Steyer) Rehder, *L benzoin* var *verna*, *L benzoin* f *xanthocarpa* (GS Torr) Rehder]

KM Davis & JL Kujawski, 2001. Propagation protocol for production of plug + transplants of *Lindera benzoin* plants (2+0 bareroot; 2+1 container); USDA NRCS - Norman A Berg National Plant Materials Center, Beltsville, Maryland. In: Native Plant Network. URL: <http://www.nativeplantnetwork.org> (accessed 28 October 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

Wm Skaradek, 2001. Propagation protocol for production of *Lindera benzoin* seeds; USDA NRCS - Cape May Plant Materials Center, Cape May Court House, New Jersey. In: Native Plant Network. URL:

<http://www.nativeplantnetwork.org> (accessed 28 October 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.



Lindera benzoin

Line drawing courtesy of Kentucky Native Plant Society. Seed photo courtesy of the US Forest Service USDA-NRCS PLANTS Database. Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image. Color photographs Julie Makin (1&2) & Albert FW Vick (3), courtesy of the Lady Bird Johnson Wildflower Center.

SASSAFRAS Presl 1825 **Sassafras** *Lauraceae* *Sassafras* (SAS-a-fras) New Latin, from Spanish *sasafrás*, possibly from an American Indian name adapted by French settlers in Florida. A small genus of 2 or 3 spp of deciduous trees in Asia (1-2) & 1 in North America. Fruits are drupes. The bark, leaves, & root bark are aromatic. [*Sassafras* Nees]

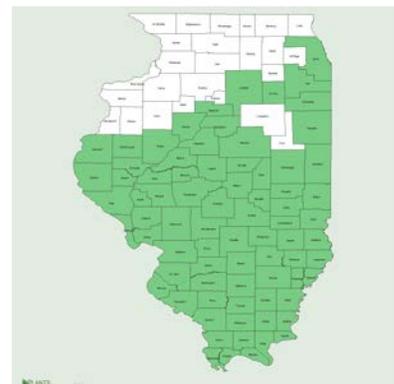
Sassafras albidum (Nuttall) Nees *ME, WI SASSAFRAS, aka AGUE TREE, *FENHELHOLZBAUM* (G), *FILÉ*, *GOMBO FIL*, *LAURIER DES IROQUOIS* (FC) *LAURO DEGL'IROCCHESI* (IT), *SASAFRÁS* (SP), *SASSAFRASBAUM* (G), *SASSAFRASSO* (IT), SILKY SASSAFRAS, WHITE or RED SASSAFRAS (AL-bi-dum for the whitish-undersides of the leaves)

Habitat: Well, drained stony or sandy soil, woods, abandoned fields (old fields), & peaty swamps. Dry or moist woodlands, thickets, roadsides. Open woods, fencerows, & thickets. “Habitat varied, forests, woodlands, fencerows, old fields (sometimes aggressively colonial), & disturbed areas; 0-1500 m” (Van der Werff fna). In Michigan, “dry sandy forests (especially oak), often on old dunes; fence-rows; mixed deciduous forests & swamps” (rvw11). In the se USA, a wide variety of forests, old fields, disturbed areas, & fencerows (w12). **distribution/range:** Common in the southern ¾ of Illinois, rare or absent elsewhere.

Culture: propagation: Seeds should be stored at 0°-5°C (dh87). “Seeds exhibit physiological dormancy. Seeds are cold stratified for 120 days & germinate at 30/20°C.” (bb02)

Kew Royal Botanic Garden notes Storage Behaviour: Orthodox?; Thousand Seed Weight: 79g average; Dispersal: Animal, diaspore is eaten intentionally, seed ingested or regurgitated; diaspore = drupe, fruit is fleshy/juicy.

asexual Propagation:



cultivation: Full sun to partial shade. Prefers moist, acidic, loamy soils, pH <6.8. Clay soil & dry sandy soil tolerant. Drought tolerant. The large taproot makes transplanting large trees difficult. Leaves may become chloritic in alkaline soils. Suckers must be removed or the specimen will become a multi-stemmed shrub.

bottom line:

greenhouse & garden:

Description: Shrub or a small to medium, deciduous, native tree, to 40', rarely 80', with 25-40' spread, suckers form large colonies; leaves ovate to elliptical, unlobed or 2-3 lobed; flowers with tepals greenish yellow, sweet, lemony fragrant, unisexual, male & female flowers are on separate trees; $N 2n = 28$. key features: "Leaves have three different shapes - 3-lobed, 2-lobed, ovate; leaves are aromatic; green twigs; flowers in few-flowered clusters; blue drupes in deep red cups (sepals); only young leaves pubescent." (Ilpin)

Comments: status: Special Concern in Maine. Extirpated in Wisconsin. phenology: Blooms April to May. Fruits mature in September. C3. Showy flowers & fruit. Flowers sweetly lemony fragrant. Useful in landscaping, as specimen planting, naturalizing, mass plantings, screens, & shrubby borders.

Associates: SASSAFRAS is a larval host of *Callosamia promethean* PROMETHEA SILKMOTH, *Papilio eurymedon* PALE SWALLOWTAIL, *Papilio troilus* SPICEBUSH SWALLOWTAIL BUTTERFLY, & PALAMEDES BUTTERFLIES. Upland gamebirds & songbirds eat fruit. Terrestrial & aquatic furbearers eat fruit, bark, & wood. Deer eat twigs & foliage, but reported to be deer tolerant. Sassafras is allelopathic & may inhibit the growth of some other plants. Known to chemically inhibit Boxelder, Elm & Silver Maple (Chick & Kielbaso 1998). No serious insect or disease problems.

Ethnobotany: Roots available anytime the ground is not frozen. Used by Iroquois & Ojibwa for flavoring & beverage (Harris 1891, Gilmore 1933). Also used for medicine, cosmetics, a fragrant oil, & as a spice. Used as medicinal beverage by Ojibwa (Gilmore 1933). The wood has been used for posts, furniture, & boxes. The original flavor source of "root beer" & sarsaparilla. The pith has been used as a gumbo-thickening agent known as *filé*.

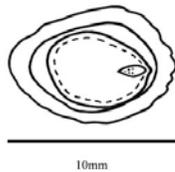
☞ Sassafras oil, primary ingredient safrole, is suspected of causing contact dermatitis, & of being hallucinogenic, carcinogenic, & hepatotoxic. Consumption of a minute quantity of the oil causes nausea, vomiting, hallucinations, & shallow rapid breathing, & kidney damage. Safrole, also found in the related tropical *Ocotea cymbarum*, is the primary precursor for synthesis of the drug MDMA (methylenedioxyamphetamine), also known as Ecstasy.

VHFS: [*Euosmus albida* Nutt, *Laurus albida* Nutt, *L sassafras* L, *L variifolia* Salisb, *Sassafras albidum* var *albidum*, *S a f moldenkei* Oswald, *S. a* (Nutt) Nees var *molle* (Raf) Fern, *S officinale* T Nees ex Eberm, *S sassafras* (L) H Karst, *S triloba* var *mollis* Raf, *S variifolium* (Salisb) Kuntze]

CC Baskin & JM Baskin, 2002. Propagation protocol for production of container *Sassafras albidum* (Nutt) Nees plants; University of Kentucky, Lexington, Kentucky. In: Native Plant Network. URL: <http://www.nativeplantnetwork.org> (accessed 28 October 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

USDA, ARS, National Genetic Resources Program. *Germplasm Resources Information Network - (GRIN)* [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?33168> (28 October 2012)



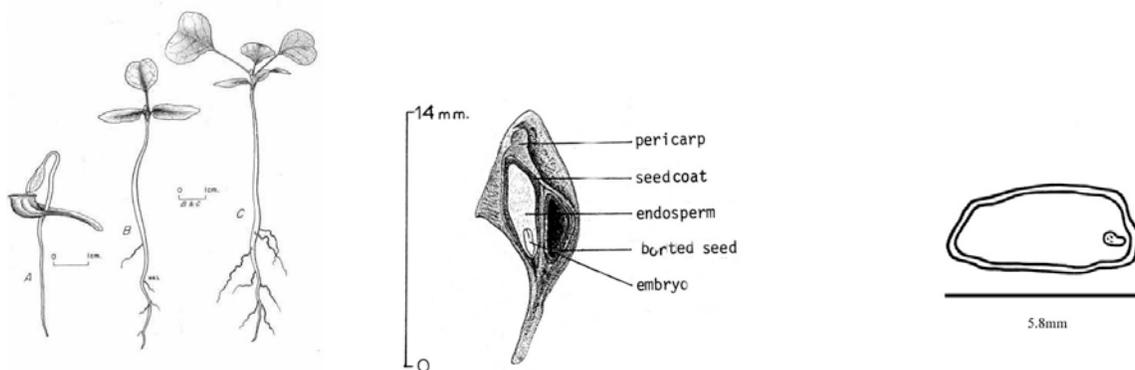


Line drawing courtesy of Kentucky Native Plant Society. Fruit & seed photo courtesy of the US Forest Service USDA-NRCS PLANTS Database. Not copyrighted image. 2nd line drawing Suzanne Foster courtesy of the US Forest Service USDA-NRCS PLANTS Database. Embryo drawing, fruit & seed photograph by Robert J Gibbons, US National Seed Herbarium images.

[BACK TO TOP](#)

MAGNOLIACEA AL de Jussieu 1789 **MAGNOLIA FAMILY** A family of about 7(6-12) genera & 223(220) spp of trees & shrubs of east & southeast Asia, the Pacific Islands, & eastern North America south through the West Indies & Central America to Brazil, with 2 genera & 9 spp in northern North America. Flowers are pollinated by beetles.

LIRIODENDRON Linnaeus **TULIP POPLAR** *Magnoliaceae* *Liriodendron* (li-ree-o-DEN-dron) Lily tree, from the Greek λειρίον, *leirion*, a lily, & δένδρον, *dendron*, tree. A genus of 2 spp of deciduous trees, relictually distributed, with our sp in eastern North America, & *L chinense* (Hemsley) Sargent in central China & northern Vietnam. Fruits are deciduous, indehiscent samaras in an elongate, spindle-shaped, dry cone (samaracetum). $x = 19$. Formerly *Tulipifera* Miller.



Seedling drawing LH - USDA-NRCS PLANTS Database - Not copyrighted image. Fruit & seed photo courtesy of the US Forest Service USDA-NRCS PLANTS Database. Not copyrighted image. Embryo drawing scanned by Robert J Gibbons, US National Seed Herbarium drawing.

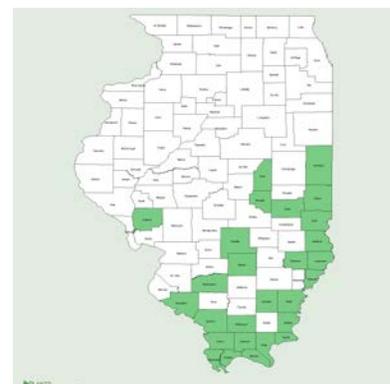
Liriodendron tulipifera Linnaeus, TULIP POPLAR, aka *BOIS-JAUNE*, CANARY WHITEWOOD, TULIP TREE, TULIP-POPLAR, TULIP-TREE, *TULPIFERO* (IT), *TULPANTRÄD* (SW), WHITE WOOD, WHITEWOOD, YELLOW POPLAR, *ooseentia*, Miami-Illinois, The common name is said to be in reference to the 2" cup-shaped flowers or the truncated, tulip-shaped leaves.

Habitat: Rich woodlands. In Michigan, "rich deciduous forests, often on sandy soils" (rvw11). In the se USA, mesic forests, cove forests in the mountains to at least 1500 m in elevation, bottomland forests, & swamps (w12). distribution/range: Southern Illinois.

A planted colony of TULIP POPLAR is naturalizing & self-seeding in an upland woods north of Princeton, Bureau Co, Illinois.

Culture: propagation:

Kew Royal Botanic Garden notes Storage Behaviour: Orthodox p; Thousand Seed Weight: 57.2g average; Dispersal: Wind, method not stated. Squirrels, also dispersed by mammals. Diaspore = samara. The diaspore has wings or wing-like features



“Viability maintained well for several years in hermetic air-dry storage as well as in moist storage at 3°-5°C (Bonner & Russell 1974); no loss in viability during 4 years moist storage in soil (Paton 1945) Comment: Seeds of this sp were classified as recalcitrant (eg, Hofmann & Steiner 1989) because of desiccation sensitivity reported (Perry 1923, Paton 1945). In fact, drying may induce secondary dormancy since air-dry stored seeds need pre-treatments to overcome it (Bonner & Russell 1974). Pre- chilling at 3°-5°C for at least 60 days, or excised embryos is required for air-dry stored seeds to germinate fully (Bonner & Russell 1974).”
<http://data.kew.org>) 10,000 (jfn04) seeds per pound.

asexual propagation:

cultivation: Best in moist, organically rich, well-drained loams in full sun. Tolerates clay soils. Tolerates part shade.

bottom line:

greenhouse & garden:

Description: Native, deciduous, large tree up to 100(140)', 30-, trunk to 8-9' diameter, often with no lower branches; leaves truncate at the end, with 2 side lobes (4-lobed), to 8.0" across; flowers yellowish-green, petal base orange banded within, to 2.0" diameter; carpels densely imbricated, 1-2 seeded, deciduous; N 2n = 38. key features: “Sp has tulip-shaped leaves; cup-shaped flowers; samara-like seeds in a dry core-like fruit.” (Ilpin)
Comments: status: phenology: Blooms April-June. Fruits mature September to October. C3. Beautiful flowering tree, flowering when in full leaf, good golden yellow fall color. Sp is the state tree of Kentucky, Indiana, & Tennessee. The largest known specimen, 44.5 m in height with a trunk diameter of 3.02 m, is recorded from Bedford, Virginia (American Forestry Association 1994). “The national champion, & the tallest tree then known in Michigan, in Cass Co, 62 m tall & 2.3 m in diameter, was toppled by a windstorm in May of 1984” (rvw11).

Associates: Songbirds & terrestrial furbearers (esp. squirrels) eat the seeds. Said to be rabbit tolerant. Aquatic furbearers eat seeds & wood. Deer eat twigs & foliage, but said to be deer tolerant. POPLAR is a larval host for *Papilio glaucus* EASTERN TIGER SWALLOWTAIL & *Papilio troilus* SPICEBUSH SWALLOWTAIL BUTTERFLY.

Ethnobotany: Native Americans used the trunks for dugout canoes. The wood is used for furniture, plywood, boatbuilding, paper pulp, general lumber, & painted trim work & cabinetry.

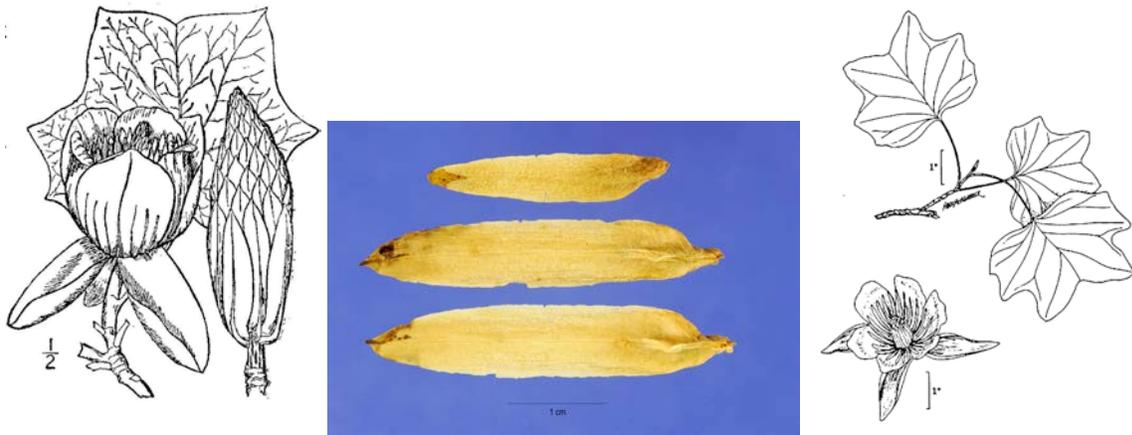
VHFS: [*Liriodendron procera* Salisbury, *Tulipifera liriodendron* Miller]

FT Bonner & T E Russel, 1974. *Liriodendron tulipifera* L In Seeds of Woody Plants in the United States. Agriculture Handbook No 450. Washington DC: Forest Service, USDA pp. 508-511.

P Hofmann & AM Steiner, 1989. An updated list of recalcitrant seeds. *Landwirtschaftliche Forschung*, 42:310-323.

RR Paton, 1945. Storage of tuliptree seed. *Journal of Forestry*, 43:764-765.

GS Perry, 1923. The solution of some forest nursery problems. *Journal of Forestry*, 21:177-179.

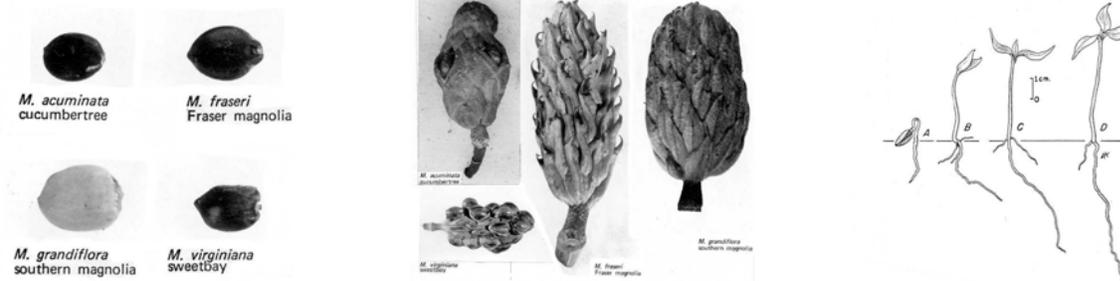


Liriodendron tulipifera

Line drawing courtesy of Kentucky Native Plant Society. Seed photo Steve Hurst USDA-NRCS PLANTS Database. Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image

MAGNOLIA Linnaeus 1753 **MAGNOLIA, CUCUMBER-TREE** *Magnolia* for Prof Pierre Magnol (1638-1715), professor & director of the botanical garden at Montpellier, France. A genus of about 120 (130) spp of trees &

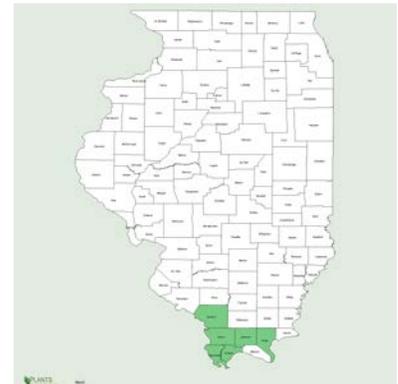
shrubs relictually distributed in eastern Asia (Himalayas & Sri Lanka to Japan & west Malaysia) & the Americas (eastern north America to the West Indies, Central America, & South America (8 spp in northern North America). The fruit is a cone-like follicetum of multiple follicles, seeds with a red, pink, or orange oily aril, extruded from the follicles, & suspended by funiculi. $x = 19$. Some spp are segregated in the genus *Yulania*. Formerly *Kobus* Nieuwland or *Tulipastrum* Spach. MAGNOLIA are pollinated by beetles.



Seed & fruit photo courtesy of USDA Forest Service, USDA-NRCS PLANTS Database. Seedling line drawing courtesy of L H USDA-NRCS PLANTS Database.

Magnolia acuminata (Linnaeus) Linnaeus *FL, IN CUCUMBER TREE, aka BLUE MAGNOLIA, CUCUMBER MAGNOLIA, CUCUMBER-TREE, *GUL POPPELMAGNOLIA* (SW), *POPPELMAGNOLIA* (SW), YELLOW CUCUMBER-TREE, YELLOW MAGNOLIA, (*acuminatus -a -um* acumina'tus (ak-yoo-min-AY-tus) Latin acuminate, long-pointed, pointed, tapering to a narrow point, with a long, narrow & pointed tip, from Latin *acumen*, *acuminis*.)

Habitat: In Missouri, in moist soils in wooded valleys, bluff bases & thickets along the Mississippi River in the far southern part of the state” (mbg). In the se USA, “Mesic to subseric forests, especially (but by no means strictly) over mafic or calcareous rocks, up to at least 1550 m (where growing with *Betula alleghaniensis*, *Abies fraseri*, *Picea rubens*, & *Sorbus americana*), ultramafic outcrop barrens (where codominant with *Pinus rigida* & *Quercus alba*)” (w11). distribution/range: Southern Illinois is on the northwest limit of this sp range, Alexander, Jackson, Johnson, Pope, Pulaski, & Union cos.



Culture: propagation:

Kew Royal Botanic Garden notes Storage Behaviour: Orthodox p; Thousand Seed Weight: 88.51g average (88.32-99.01). Viability maintained for several years in hermetic air-dry storage at 0°C to 5°C (Olson et al 1974)

asexual propagation:

cultivation: Best grown in moist, organically rich, well-drained loams in full sun to partial shade.

Intolerant of excessively dry or wet soils. Intolerant of most urban pollutants.

bottom line:

greenhouse & garden:

Description: Native, deciduous tree; 40-70 (100)', 20-30' spread; leaves ovate, yellow-green, to 10" long; aril reddish orange; $2n = 76$. key features:

Comments: status: Endangered in Florida & Indiana. phenology: Blooms Showy, fragrant flowers. Sp serves as a good shade or lawn tree. Good gold fall color.

The largest known specimen of *Magnolia acuminata* is a cultivated tree in Waukon, Iowa, 29.6 m in height with a trunk diameter of 1.26 m (American Forestry Association 1994).

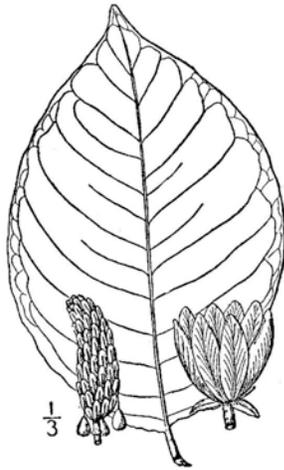
Associates: No serious insect or disease problems.

Ethnobotany:

VHFS: Many infraspecific taxa have been identified, but they lack any consistent pattern or geographic correlation (JW Hardin 1972, 1989, in FG Meyer in FNA). [*Magnolia virginiana* L var (e) *acuminata* Linnaeus, Sp. Pl. 1: 536. 1753 (basonym), *Kobus acuminata* (L) Nieuwl, *Magnolia acuminata* var *alabamensis* Ashe, *M a* var *aurea* (Ashe) Ashe, *M a* subsp *cordata* (Michx) E Murray, *M a* var *cordata* (Michaux) Seringe, *M a* var *ludoviciana* Sargent, *M a* var *ozarkensis* Ashe, *M a* var *subcordata* (Spach) Dandy, *M cordata* Michx, *Tulipastrum acuminatum* (L) Small, *T a* var *aureum* Ashe, *T a* var *flavum* Small, *T a* var *ludovicianum* (Sargent) Ashe, *T a* var *ozarkense* (Ashe) Ashe, *T americanum* Spach, *T a* var *subcordatum* Spach, *T cordatum* (Michx) Small] **check synonyms**

against Tropicos

DF Olson Jr, RL Barnes, & L Jones, 1974. *Magnolia* L In Seeds of Woody Plants in the United States. Agriculture Handbook No 450. Washington DC: Forest Service, USDA pp 527-530.



Magnolia acuminata

Line drawing courtesy of Kentucky Native Plant Society. Seed photo Steve Hurst USDA-NRCS PLANTS Database.

Magnolia virginiana Linnaeus *MA, NY, PA, TN SWEET BAY, aka *LAURIER DOUX*, SWAMP BAY,
Habitat “Swamps, bays, low wet woods, savannahs; chiefly in coastal plain & lower piedmont; 0-540 m” (FG Meyer fna). In the se USA, “Pocosins, bay forests, & swamps in the Coastal Plain, streamhead pocosins, swamps, & sandhill seeps in the Sandhills, bogs & peaty swamps in the Piedmont” (w11). distribution/range: Widely cultivated. The most widely distributed sp in northern North America (fna) but compare to *M acuminata*.

There is a northern, multi-trunked, deciduous form, & a southern, single-trunked, evergreen form.

Culture: propagation:

asexual propagation:

cultivation:

bottom line: Greenside up.

greenhouse & garden:

Description: Seeds red-arilled; $N 2n = 38$. key features:

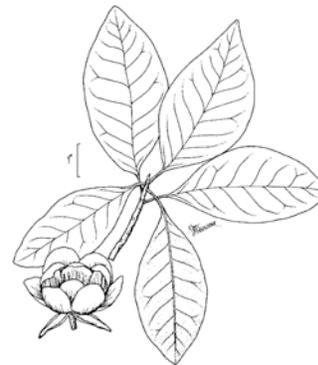
Comments: status: phenology: Blooms April - July.

The largest known specimen of *Magnolia virginiana* (evergreen form) is a cultivated tree in Union Co, Arkansas, 28 m in height with a trunk diameter of 1.4 m (American Forestry Association 1994).

Associates: Larval host for *Papilio glaucus* EASTERN TIGER SWALLOWTAIL, & the *Papilio troilus* SPICEBUSH SWALLOWTAIL BUTTERFLY. The wood fluoresces pale yellow under ultraviolet lights.

ethnobotany:

VHFS: Selections of both forms are available for landscaping.



Magnolia virginiana

Line drawing courtesy of Kentucky Native Plant Society. Seed photo Steve Hurst USDA-NRCS PLANTS Database. Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image

[BACK TO TOP](#)

NELUMBONACEAE Dumortier 1829 **LOTUS-LILY FAMILY** A family of 1 genus & 2 spp of aquatic perennials of temperate & subtropical eastern North America & east Asia. *Nelumbos* are pollinated by insects, often beetles. (*Nelumbo* was formerly considered part of the *Nymphaeaceae*, but it is now in its own family that is placed in the Proteales in the Eudicots.)

NYMPHAEACEAE R A Salisbury 1805 **WATER LILY FAMILY** From *Nymphaea* (nimf-IE-a) New Latin, from Latin for water lily, from Greek *nymphaia*, akin to Greek *Nymphe*, a water nymph, or Naiad, of the waters, or *nymphē*, a bride, & Latin *nymphaea*, water-lily, from Latin *nympha*, mythology, goddess of mountains, waters, meadows, & forests. A family of 6(5) genera & about 50(70-75) spp of aquatic herbs, cosmopolitan, with 2 genera & about 17 spp in northern North America. The *Cabombaceae* & *Nelumbonaceae* were formerly included in a broadly defined *Nymphaeaceae*. Insect pollinated, often by beetles.

BRASENIA Schreber **WATER SHIELD, WATER TARGET** *Nymphaeaceae* *Brasenia* New Latin, for Christoph *Brasen* (1774), 18th century Danish surgeon & plant collector in Greenland & Labrador, Moravian missionary, leader of the 1771 missionary expedition that established the Moravian missionary of Nain on the coast of Labrador; name of unknown origin in one source. Monotypic genus, worldwide except Europe, mainly temperate & upland tropics. $x = 40$. Sometimes placed in *Cabombaceae* A Richard 1828.

Brasenia schreberi JF Gmelin **WATER SHIELD**, aka *AGOAPÉ* (SP), *BRASÉNIE DE SCHREBER* (F), *CHUN CAI* (CH), **DOLLAR BONNET**, *JUNSAI* (J), **PURPLE WEN-DOCK**, *SCHLEIMKRAUT*, **SCHREBER WATERSHIELD**, *SUNCHAE* (K), **WATER-SHIELD, WATER-TARGET**, (*schreberi* for Johann Christian Daniel *Schreber* (1736-1810), German botanist.) **OBL**
Habitat: Clear quiet lakes, marshes, & ponds, including bog ponds, in up to 5.0' of water, usually with a soft, nutrient rich substrate. **distribution/range:** North & South America, east Asia, Africa, & east Australia, worldwide except Europe, where it is known as fossils. (Wiersema fna).

Culture: propagation:

Kew Royal Botanic Garden notes Thousand Seed Weight: 6.78g average (2.6 (seed)-10.955 (diaspore)).

1,250,000 (jfn04) seeds per pound.

asexual propagation:

cultivation:

bottom line:

greenhouse & garden:

Description: Native, floating, perennial aquatic forb; from rhizomes; height just above the water's surface; stems purple; leaves elliptical, 2.5" by 4.5", un-notched, peltate, shiny green above, purple below; flowers about 2.0 cm diameter, 4-merous but can be 3-merous, perianth parts dull purple (reddish brown to dull purple, violet); fruits club-shaped, leathery, 1-2 seeded; $N 2n = 80$ (China $2n = 72, 80$). **key features:** "Flowers can also be 3 merous. Leaves centrally peltate; plant covered with a viscid jelly." (Ilpin) All below plant parts coated with thick, slimy, gelatinous coating; stalks attached to the center of an un-notched, elliptical leaf (fh). Rooted, floating plants with oval leaves that are green on the upper surface & purple on the lower surface. Additionally, the jelly-like material that covers all submerged portions of the plant helps to distinguish this weed from most other aquatic weeds.

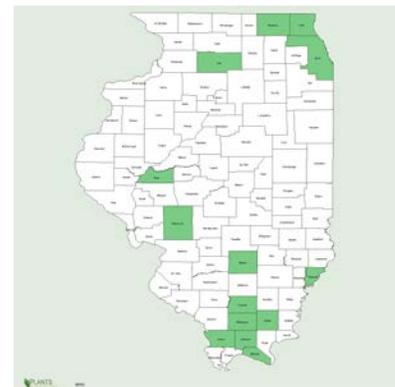
(Virginia Tech)

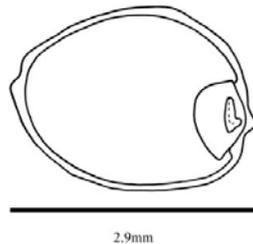
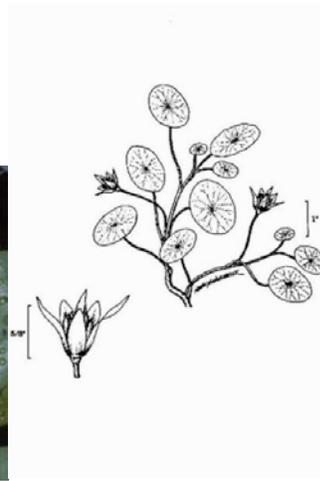
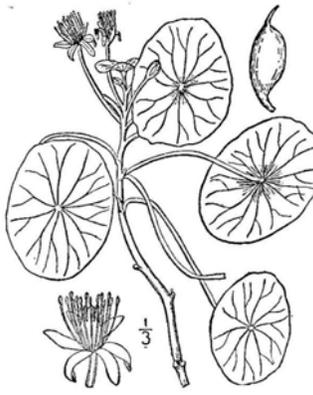
Comments: status: phenology: Blooms June-August (September). C3.

Associates: Wind pollinated. Colonies provide shade & cover for fish. Seeds & leaves provide food for water birds.

Ethnobotany: The roots, young leaves, & petioles are edible. Native Americans used the tubers for food.

VHFS: [*Brasenia hydropeltis* Muhl ex Raf, *B nymphoides* Baillon, *B peltata* Pursh, *B purpurea* (Michx) Casp, *B purpurea* Casp, *Cabomba peltata* (Pursh) F Muell, *Hydropeltis purpurea* Michx 1803 (basionym)]





Brasenia schreberi

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[BACK TO TOP](#)

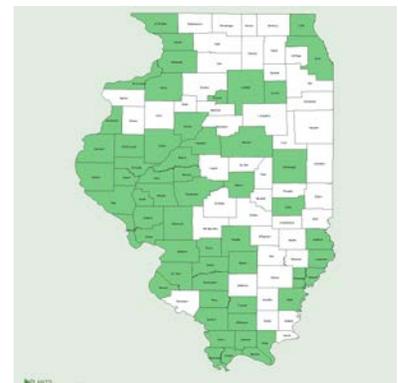
CASTALIA *Nymphaeaceae* *Castalia* from *Castalia*, a spring on Parnassus sacred to the Muses, from Latin, from Greek *Κασταλία*, *Kastalia*, meaning a source of poetic inspiration. The genus *Nymphaea* was sometimes placed here, with the name often used in native plant specifications.

NELUMBO Adanson 1763 **LOTUS, WATER BEANS, LOTUS-LILY, SACRED-LOTUS, SACRED-BEAN** *Nymphaeaceae* *Nelumbo* (ne-LUM-bo) scientific Latin from Linnaeus & Adanson, from the Sinhalese (or Ceylonese) vernacular name for ASIAN LOTUS; from Sinhala *neḷum-*, *neḷumba*, from earlier unattested *neḷun*, from unattested Sanskrit *naḷina* lotus, probably via Portuguese *nelumbo* (OED). A genus of 2 spp of aquatic herbaceous perennials of temperate & subtropical eastern North America & east Asia. 1-seeded nuts. The Asian *Nelumbo nucifera* Gaertner is established in 16 states in eastern & southeast USA. **Now placed in the *Nelumbonaceae*** in the Eudicots. Formerly *Nelumbium* in *Nelumbiaceae*, or *Nelumbonaceae*(?)

“*Nelumbo* can be immediately distinguished in vegetative condition from the other "pads" (*Nymphaea*, *Nuphar*, & *Nymphoides*) by its peltate leaves, & from the peltate *Brasenia* by the much larger size & roundness of the leaves” (w11).

Nelumbo lutea Willdenow (or (Willd.) Pers.) *MI, NJ, PA *NOX CT, PR AMERICAN LOTUS, aka AMERICAN LOTUS-LILY, AMERICAN WATER LOTUS, AMERIKANISCHE LOTOSBLUME (G), LOTUS, LOTUS-LILY, POND NUTS, SACRED BEAN, *VOLÉE*, *WONKAPIN*, WATER CHINQUAPIN, YOCKERNUT, YONKAPIN, YELLOW LOTUS, (*luteus -a -um* (LOO-tee-us) yellow, a distinct yellow, a full yellow; pale yellow, from Latin adjective *luteus -a -um*, yellow; saffron; of mud or clay; good for nothing.)

Habitat: Ponds, quiet streams, & estuaries. Fresh water with a soft mud bottom, 1-3' in depth. Bays, sloughs, & ponds. “Sp is distributed in floating, fresh water 1-3' (< 2.5') depth, bays, sloughs; muddy shores; quiet water” (Ilpin). **distribution/range:** Sp was probably originally confined to flood plains



of major rivers & their tributaries in the east-central United States & carried northward & eastward by aborigines who used the seeds & tubers for food (Wiersema fna).

Culture: No pretreatment needed. Scarify. Sow seeds in mud at 70°F in a very wet place. (ew11)

Kew Royal Botanic Garden notes Storage Behaviour: Orthodox; 83% germination following 55 years open storage at room temperature (Ewart 1908); seeds survive 56 years in herbarium (Dent 1942) 400 (ew11); 512 (jfn04) seeds per pound. Anon 1981 & Ilpin recommend 500 scarified seeds per acre.

cultivation: Space plants 0.5-2.0'.

Description: Floating perennial; flowers white to yellow, 2-10" wide, 7-merous; $N 2n = 16$. key features: "Leaves are centrally peltate, raised high out of the water" (Ilpin). Flowers held up to 3' above the water; leaves unnotched, held above the water, stalks attached at the center of the leaf (fh).

Comments: status: Threatened in Michigan. Endangered in New Jersey & Pennsylvania. Potentially invasive & banned in Connecticut. Noxious in Puerto Rico. This taxon is considered weedy or invasive in some parts of its range or under certain applications (Assorted authors. 200_. State noxious weed lists for 46 states). phenology: Blooms 7-9. C3. Flowers are showy & fragrant. May be aggressive & difficult to eradicate from lakes, ponds, & reservoirs.

Associates: Waterfowl eat the seeds & roots. Aquatic furbearers eat the entire plant. Plants provide cover & food for fish. Provides cover for waterfowl & aquatic mammals.

Ethnobotany: Leaves, roots, & seeds are edible. The nuts are nutritious & the rhizomes farinaceous in season. Tubers available in spring & autumn; nuts available in late summer & autumn. Used by Ojibwa, Pottawatomie, & Sauk-Fox; dried & stored for winter. (sm28, 32, 33). Seeds found with Woodland & Iroquoian pottery at Johnson site on Isle Royale.

VHFS: [*Nelumbium luteum* Willd, orth var, *Nelumbo nucifera* Gaertn subsp *lutea* (Willd) Borsch & Barthlott, *Nelumbo pentapetala* sensu Fern, non *Nymphaea pentaphylla* Walter]

TV Dent, 1942. Some records of extreme longevity of seeds of Indian forest plants. Indian Forester, 68:617-631.

AJ Ewart, 1908. On the longevity of seeds. Proceedings of the Royal Society Victoria, 21:1-210.



Nelumbo lutea

Line drawing courtesy of Kentucky Native Plant Society. Photo Robert H Mohlenbrock USDA-NRCS PLANTS Database. - Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image.

[BACK TO TOP](#)

NUPHAR JE Smith 1809 **SPATTERDOCK, YELLOW POND LILY, POND LILY, COW LILY, NÉNUPHAR,** *Nymphaeaceae* *Nuphar* (NEW-far) New Latin, from ancient Arabic or Persian *neufar*, or *nufar*, short for *naynufar*, water lily or Egyptian Lotus. A genus of about 16 spp of water lilies of north temperate areas having flowers with showy usually yellow sepals & minute petals that resemble stamens or scales, leaves with a deep sinus, & a cylindrical creeping rootstock, about 8(6) taxa in northern North America. $x = 17$. Ball (1956), plants.usda.gov, & others treat the North American plants as subsp of the European *N lutea*, with about 8 subsp. Others, including Voss (1985), Weakley (2012), & BONAP (2010) feel they are easily distinguished, closely related spp. Subfamily *Nupharoideae*.

“Prior to conservation in its current sense, the name *Nymphaea* was frequently used for *Nuphar*. Although often treated as neuter, *Nuphar* was originally assigned the feminine gender (WT Stearn 1956; HW Rickett & FA Stafleu 1959).” (Wiersema & Hellquist fna)

Nuphar advena (Aiton) R Brown ex Aiton f * CT, WI YELLOW POND LILLY, aka BROADLEAF POND LILLY, SPATTERDOCK, (*adventus -a -um* (ad-VEN-us) alien, exotic, stranger, foreign, adventive, newly arrived from Latin *adventus* adventive, foreign, from Latin, *adventus -a -um*, foreign; or from *advenus*?)

Habitat: Pond margins & swamps, soft bottom lakes, ponds, sloughs, hard or soft water, 1.0-4.0' deep (Ilpin). In Michigan, lakes, ponds, river margins, & streams (rvw11). In the se USA, “Lakes, ponds, natural depression ponds, old millponds, slow-flowing rivers (blackwater & brownwater)” (w12).

distribution/range: The most common & widespread *Nuphar* in eastern North America. Occasional throughout Illinois.

Culture: propagation:

asexual propagation: From rootstock ends.

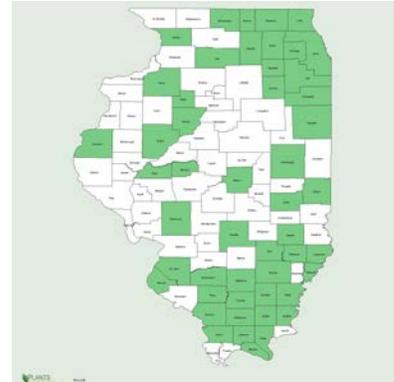
cultivation:

bottom line:

greenhouse & garden:

Description: Native, floating, perennial, aquatic forb, rooted in mud; key

features: “Petiole is terete to flattened; sepals are green; fruit is leathery; eventually breaking irregularly” (Ilpin).



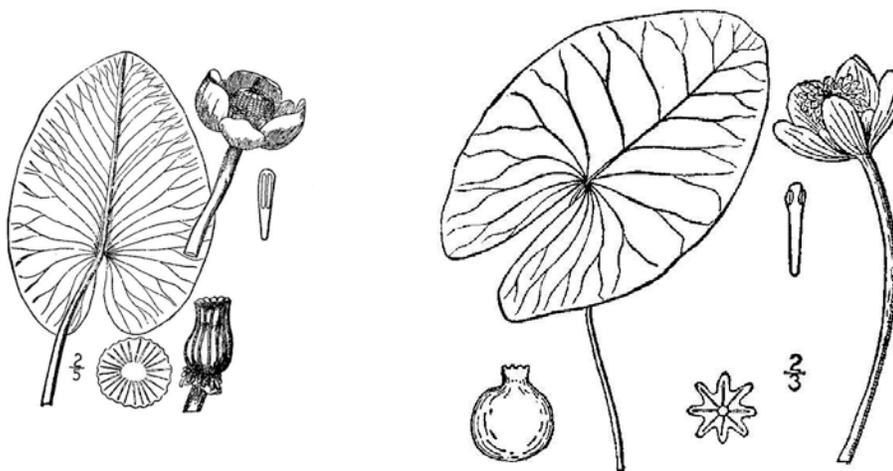
“We have only one sp which is common in sloughs & slow streams. The name we give is that of Jones’ Flora but our plant answers better the description given in Gray’s Man, 8th Ed, of *N variegatum* Engelm. The rhizome is oval or round in section & is not uncommonly 3 or more inches in diameter.” (ewf55)

Comments: status: Special Concern in Connecticut, Maine, & Wisconsin. phenology: Blooms (April)May - August(September, October). C3.

Associates: Waterfowl eat tubers & seeds. Aquatic furbearers, (esp beaver & muskrat) eat plants. Marsh birds & shorebirds eat stems, root, & seeds. Fish eat plants & use them for cover.

Ethnobotany: Roots & seeds are edible. Tubers available in autumn to early spring. Used by Sauk Fox, Menominee, Mascouten, & Iroquois (Skinner 1925, 1926, sm23, Parker 1910). Root used as medicinal plant by Ojibwa, Menominee, & Pottawatomie (sm23, 32, 33) rhizome astringent & demulcent (den28).

VHFS: In Britton & Brown (1913), this is *Nymphaea advena* & *Nymphaea macrophylla*. In plants.usda.gov, this is *Nuphar lutea* (L) Sm ssp *advena* (Aiton) Kartesz & Gandhi. In Ilpin, this is called *Nuphar lutea* (L) Sm ssp *macrophylla* (Small) EO Beal. [*Nymphaea advena*, *N luteum macrophyllum* (Small) Beal]



Nuphar advena

Line drawings courtesy of Kentucky Native Plant Society.

Nuphar lutea (Linnaeus) Small * CT, ME, MA, MI, NJ, OH YELLOW POND LILY, AKA BULLHEAD-LILY, LARGE YELLOW POND LILY, SMALL YELLOW POND LILY, TINY COW- LILY,

Habitat: distribution/range: In the broad sense, a widespread sp of Europe & North America.

Culture: propagation:

asexual propagation:

cultivation:

bottom line:

greenhouse & garden:

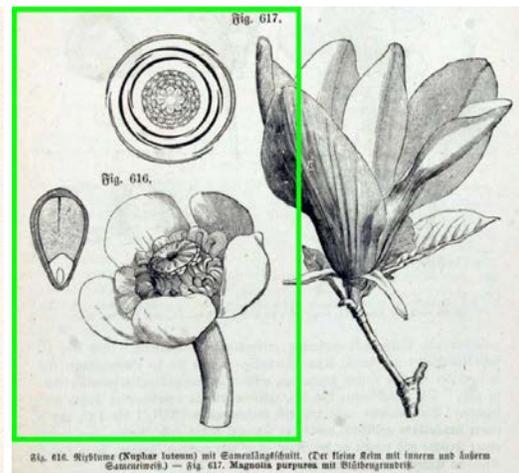
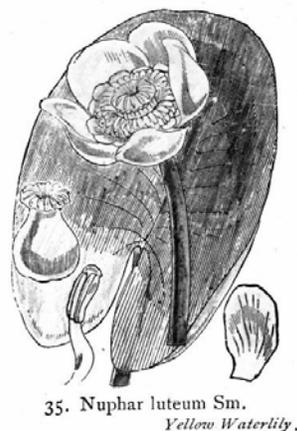
Description: plant key features:

Comments: status: *Ssp advena* is Special Concern in Connecticut & Maine. *Ssp microphylla* is Special Concern in Connecticut, Endangered in Massachusetts, & New Jersey. *Ssp pumila* is endangered in Michigan. *Ssp variegata* is Endangered in Ohio. phenology: Blooms

Associates:

Ethnobotany:

VHFS: The sp *sensu lato* in North America includes *N lutea* (L) Sm *ssp advena* (Aiton) Kartesz & Gandhi, *N lutea* (L) Sm *ssp orbiculata* (Small) EO Beal, *N lutea* (L) Sm *ssp polysepala* (Engelm) EO Beal, *N lutea* (L) Sm *ssp pumila* (Timm) EO Beal, *N lutea* (L) Sm *ssp rubrodisca* (Morong) Hellquist & Wiersema, *N lutea* (L) Sm *ssp sagittifolia* (Walter) EO Beal, *N lutea* (L) Sm *ssp ulvacea* (GS Mill & Standl) EO Beal, & *N lutea* (L) Sm *ssp variegata* (Durand) EO Beal.



Nuphar lutea

Line drawing Walter Hood Fitch - Illustrations of the British Flora (1924) - Permission granted to use under GFDL by Kurt Stueber. Source: www.biolib.de. Color illustration Jacob Sturm, Johann Georg Sturm - *Deutschlands Flora in Abbildungen* (1796). Copyright expired. Source: www.biolib.de. Line drawing from Thomé, Otto Wilhelm - *Lehrbuch der Botanik für Gymnasien, Realschulen, forst- und landwirthschaftliche Lehranstalten, pharmaceutische Institute etc. sowie zum Selbstunterrichte*. 2. Auflage. (1872). Permission granted to use under GFDL by Kurt Stueber. Source: www.biolib.de.

***Nuphar variegata* Durand** [also *Nuphar variegatum* Engelm. or *N variegata* Engelm. ex Durand] *OH
BULLHEAD LILY, aka BULL-HEAD POND-LILY, *GRAND NÉNUPHAR JAUNE* (FR), SPATTERDOCK, VARIEGATED YELLOW POND-LILY,

Habitat: Ponds & shallow water. "Ponds, lakes, sluggish streams, & ditches; 0-2000 m" (Wiersema & Hellquist fna). distribution/range: Illinois is at the southern limit of the sp range. Rare in Illinois, Cook, Grundy, Lake, & McHenry cos.

Culture: propagation:

asexual propagation:

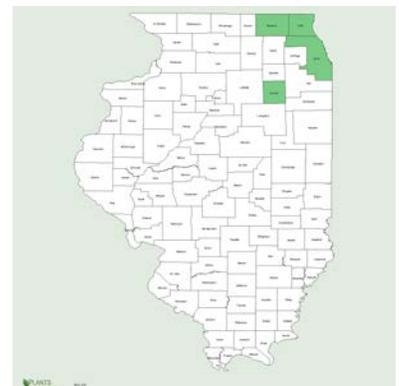
cultivation:

bottom line:

greenhouse & garden:

Description: Native, perennial, aquatic forb; from large, spongy rhizomes with the old leaf scars forming spirals; leaves mostly floating, occasionally submerged, leafstalk flattened & slightly winged; 6 showy, petal-like sepals; N

2n = 34. key features: "Petiole is conspicuously flattened; fruit is leathery, eventually breaking irregularly; sepals are usually red-tinged" (Ilpin). Flowers 1.0-2.0" wide, most leaves floating, stems flattened & slightly winged (fh). "The leaves are characteristically floating, being emergent only under low-water conditions (Wiersema & Hellquist fna). COMMON SPATTERDOCK (*N lutea* ssp *advena*) is very similar, but its leaves are frequently raised above the



water.

Comments: status: Endangered in Ohio. phenology: Blooms May - August. C3.

Associates:

Ethnobotany:

VHFS: [*Nuphar americana* Provancher, *N advena* (Aiton) WT Aiton var *fraterna* (GS Mill & Standl) Standley, *N fraterna* (GS Miller & Standley) Standley, *N lutea* (Linnaeus) Smith subsp. *variegata* (Durand) EO Beal, *Nymphaea americana* GS Mill & Standley, *N americana* (Provancher) G S Miller & Standley, *N fraterna* GS Miller & Standley]

[BACK TO TOP](#)

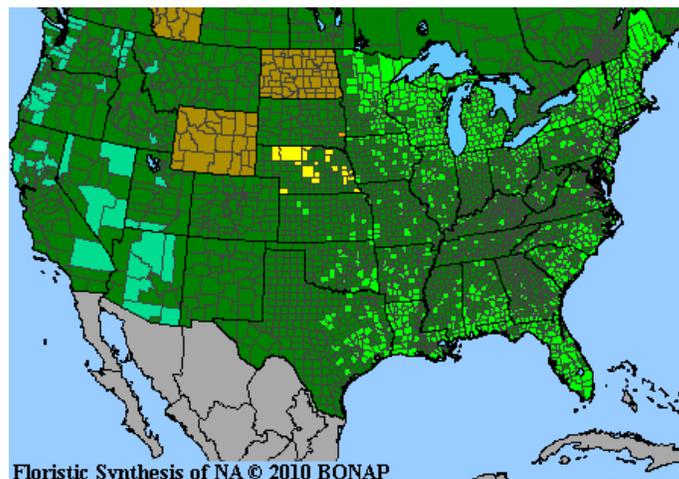
NYMPHAEA Linnaeus 1753 **WATER-LILY, WATER NYMPH, NYMPHÉA, LIS D'EAU, NÉNUPHAR BLANC, SEEROSE** *Nymphaeaceae* *Nymphaea* (nimf-IE-a) New Latin, from Latin for water lily, from Greek *nymphaia*, akin to Greek *Nymphe*, a water nymph, or Naiad, of the waters, or *nymphé*, a bride, & Latin *nymphaea*, water-lily, from Latin *nympha*, mythology, goddess of mountains, waters, meadows, & forests. A genus of about 50(35-40) spp, cosmopolitan, of aquatic perennial water lilies with sometimes fragrant flowers that have four green sepals & numerous petals that are as large as the sepals in the outer whorls & diminish centrally to the size & appearance of stamens & occur in white, pink to red, blue, & yellow in various members of the genus. The seeds have arils. $x = 14$. "Prior to conservation in its current sense, the name *Nymphaea* was frequently used for the genus now known as *Nuphar*" (Wiersma & Hellquist fna). In the late Pleistocene / early Holocene, this was known as *Castalia* Salisbury.

"The stems of *Nymphaea* contain a powerful astringent principle, which is removed by repeated washing in water, after which they are tasteless, & may be used for food" (Wood 1873). Many cultivars & wild spp are used in water gardening, habitat improvement, & wetland restoration.

The following 2 taxa have been considered 2 spp, subsp of a single polymorphic sp, or 1 variable sp with no infraspecific taxa. The taxa are distinct where allopatric but the distinctions blur where they are sympatric. "Our common white water-lilies have long been considered to represent two spp, but are now usually regarded as one, with some authors recognizing the variation at the rank of subsp; the subsp *odorata*, often a smaller plant with petioles lacking red stripes & leaf blades usually with purple undersides, & subsp *tuberosa* (Paine) Wiersma & Hellquist, a mostly larger plant with petioles purple-striped & leaves green or faintly purple tinged beneath. Both are widespread in Michigan & intermediate plants also occur." (rvw11)

Petiole not striped, rarely faintly striped; leaf blade abaxially usually reddish purple, occasionally green; seeds 1.5-2.5 mm. "odorata"

Petiole with brown-purple stripes; leaf blade abaxially green or faintly purple; seeds mostly 2.8-4.5 mm. "tuberosa"



Nymphaea odorata, sensu lato. Compare the distribution with the following maps ripped from FNA. North America map courtesy of BONAP (2010)

Nymphaea odorata Aiton [alternately *Nymphaea odorata* Aiton ssp. *odorata*]

*NOX WA WHITE WATER LILY, aka AMERICAN WATERLILY, AMERICAN WHITE WATERLILY, FRAGRANT WATER LILY, *NYMPHÉA ODORANT* (FR), POND LILY, SWEET SCENTED WATERLILY, WHITE WATERLILY, *WOHLRIECHENDE SEEROSE* (G), Ojibwa common name translates as “root” (*odoratus -a -um* (o-do-RAH-tus) Latin scented, odorous, fragrant, sweet-smelling.)

Habitat: Ponds, dead waters, & bog pools. In Michigan, “Ponds & sheltered areas of lakes & rivers, the mature leaf blades all floating on the surface of the water.

Occasionally, foliage & even flowers can be found amid sphagnum & shrubs in a bog mat, silent testimony to plant succession from the days before the water-lily was engulfed by the mat as it grew toward the center of the bog lake.” (rvw11).

distribution/range: Rare in Illinois, Cook, Franklin, Johnson, McHenry, Perry, & Union cos.

Culture: propagation:

asexual propagation:

cultivation:

bottom line:

greenhouse & garden:

Description: $N 2n = 56, 84$. key features:

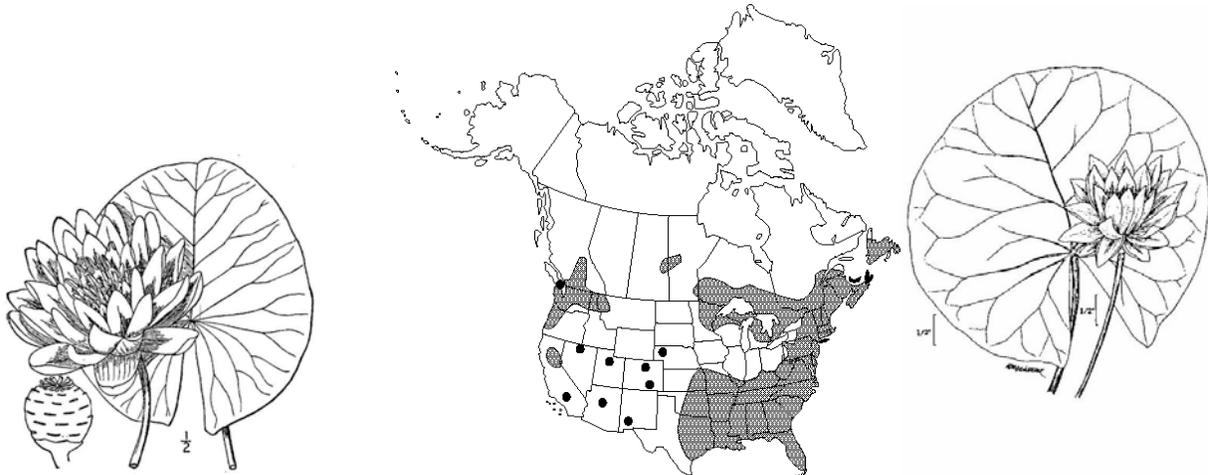
Comments: status: NOX Class C in Washington. phenology: Blooms

Associates: Ethnobotany: Flower buds available June to September. Used for food by Ojibwa (sm32). Root used as medicinal plant by Ojibwa & Pottawatomie (sm32, sm33). Ojibwa medicinal plant for sore mouth.

VHFS: In Britton & Brown (1913), this is *Castalia odorata*. [*Castalia lekophylla* Small, *C minor* (Sims) de Candolle, *C odorata* (Ait) Woodville & Wood, *Castalia reniformis* DC, *Nymphaea minor* (Sims) DC, *N odorata* forma *rubra* (E Guillon) Conard, *N odorata* Sol, *N odorata* Ait var *gigantea* Tricker, *N odorata* Ait var *godfreyi* DB Ward, *N odorata* Ait var *minor* Sims, *N odorata* Ait var *rosea* Pursh, *N odorata* Aiton var *stenopetala* Fern, *N odorata* Ait var *villosa* Caspary] More synonyms at ARS-GRIN.



Nymphaea odorata



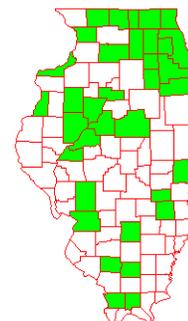
Nymphaea odorata

Line drawing courtesy of Kentucky Native Plant Society. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image. Illinois map courtesy of ILPIN. North American map courtesy of FNA & Midnight Acquisitions.

Nymphaea tuberosa Paine [alternately *Nymphaea odorata* Aiton ssp. *tuberosa*

(Paine) Wiersma & Hellquist] WHITE WATER LILY, aka AMERICAN WHITE WATERLILY, *NYMPHÉA TUBÉREUX* (FR), (*tuberosus -a -um* (tew-be-RO-sus) tuberous, producing or tubers or organs resembling tubers, from the Latin *tuberosus*, for the tuberous, or thickened root, related to the root words of *Typha*, Latin *tumere*, to swell.)

Habitat: Soft bottom lakes, ponds & sloughs. Hard or soft water. 1’-4’ deep, quiet water (Ilpin). “Mainly alkaline ponds, lakes, & sluggish streams & rivers, usually in very oozy sediments” (Wiersema & Hellquist fna). distribution/range:



Nymphaea tuberosa

Culture: propagation: Anon 1981 says plant root stock ends in spring or fall for quicker results, or, tubers in spring or fall, 750 per acre.

asexual propagation:

cultivation:

bottom line:

greenhouse & garden:

Description: plant flower white, 7+ parted; fruit is a berry? key features: Leaves round, purple beneath, most floating, stalks with brown/purple stripes (Freck).

Comments: status: This taxon is considered weedy or invasive in some parts of its range or under certain applications (Assorted authors. 200_. State noxious weed lists for 46 states). phenology: Blooms June - August. C3.

“Much less common than the preceding (*Nuphar advena*): grows in similar places but the two are not often found together. Sugar River slough west of Shirland & in another slough west of Yale bridge. In a Killbuck Creek slough at US Rt. No 51 it grows with the preceding.” (ewf55)

Associates: Waterfowl eat tubers & seeds. Aquatic furbearers (esp beaver & muskrat) eat plants. Marsh birds & shorebirds eat stems, roots, & seeds.

Ethnobotany:

VHFS: In Britton & Brown (1913), this is *Castalia tuberosa*. [*Castalia tuberosa* (Paine) Greene, *Nymphaea odorata* Aiton var *maxima* (Conrad) B Boivin, *Nymphaea tuberosa* Paine]



Nymphaea tuberosa

Line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image. Photo Robert H Mohlenbrock USDA-NRCS PLANTS Database - Not copyrighted image. Seed photo Jose Hernandez USDA-NRCS PLANTS Database. - Not copyrighted image. Illinois map courtesy of ILPIN. North American map courtesy of FNA & Midnight Acquisitions.

[BACK TO TOP](#)

SAURURACEAE E Meyer 1827 **LIZARD’S-TAIL FAMILY** *Saururaceae* Saurura'ceae (sore-ur-AY-see-ee)
plants of the LIZARD’S-TAIL family, from Greek σάυρα, σαῦρος, *saura*, *sauros*, lizard, -ουρα, -oura, tail, & -aceae,

the standardized Latin suffix of plant family names. A family of 4 (5) genera & 6(7) spp of perennial herbs of temperate eastern & southeast Asia, western North America, & eastern North America, with 2 genera & 2 spp in northern north America.

Saururus Linnaeus 1753 **LIZARD’S-TAIL, WATER DRAGON** *Saururaceae* *Saururus* lizard’s tail, New Latin, from Greek σαύρα, σαῦρος, *saura, sauros*, lizard, & -ουρα, -oura, tail, (or -urus). “The elongate inflorescence, drooping at the tip, is distinctive, attractive, & the fanciful inspiration for the genus name, the specific epithet, & the common names” (w11). A genus of 2 spp of temperate eastern North America & east Asia; fruits are schizocarps; mericarps dry, indehiscent; seed 1 per mericarp. X = 11.

Saururus cernuus Linnaeus *CT, RI *NOX PR LIZARD’S TAIL, aka BREAST WEED, *CODA DI LUCERTOLA*, *LÉZARDELLE PENCHÉE* (F), LIZARDS TAIL, LIZARD’S-TAIL, *ÖDLESVANS* (SW), SWAMP LILY, WATER DRAGON, (from Latin *cernuus*, nodding, from *cernuus -a -um*, inclining the head, stooping.)

Habitat: Marshes, along streams, edges of lakes, & the understory of moist forests. “Sp is distributed in swampy woods, slough borders, sometimes in standing waters; edges of woodland pools; semi-shaded ditches” (Ilpin, m02). “Wet soil, fresh or slightly brackish water to depth of 5 dm; 0-500 m” (Buddell & Thieret fna). In Michigan, swamps (usually deciduous but sometimes cedar), floodplains, shallow water, & mudflats at the borders of streams & ponds (rvw11). In the se USA, “Swamps, overwash pools in stream floodplains, ditches, usually where water ponds seasonally or periodically” (w11). distribution/range: Occasional to common in the southern 2/3 of Illinois, rare elsewhere.

Culture: propagation: 509,662 (gnhe13), 524,249 (gnhe15), 548,309 (gnhe11); 5,500,000 (jfn04); 18,916,667* (gnh03) seeds per pound.

asexual propagation: Easy by division of offsets.

cultivation: Best in full sun to partial shade, wet soils, but sp will flower in shade. In water gardens, plant containers in 6” of water. In natural ponds or pond margins, plant in 2.0-4.0” of shallow water or in sandy, boggy, or muddy pond margins. Will grow in 6.0” of water in ideal situations. Tolerates wet soil & dense shade. Zone 3-9.

bottom Line: Test data indicate dormant seeding is necessary.

Germ 22.3, 5.8, na, sd 27.2, r0.0-68 (68)%. Dorm 53.3, 53, 90, sd 34.3, r13.5-90 (76.5)%. Test 35, 32, na, r29-40 days.**

greenhouse & garden:

Description: Erect, marginal aquatic perennial forb; 1.0-2.0(4.0); tall, 1.0-2.0’ spread; aggressively rhizomatous, flowers white, showy, fragrant, 4-merous; followed by small, warty, green fruits; N 2n = 22. key features: The base of the petiole surrounds the stem, leaving a scar that encircles the stem (rvw11).

Comments: status: Endangered in Connecticut & Rhode Island. Noxious in Puerto Rico. phenology: Blooms May-September (spring to summer, sometimes early fall). Fruits ripen in August to October. C3. Flowers are showy & fragrant. The leaves, flowers & roots have a pleasant, citrus aroma (sassafras to some). Useful in the landscape, water gardens, bog gardens, pond edges, tubs, ornamental pools, shaded wetland gardens, forested wetlands, shoreline stabilization, & shaded, wet, rich soil rain gardens. Sp is too aggressive for small gardens.

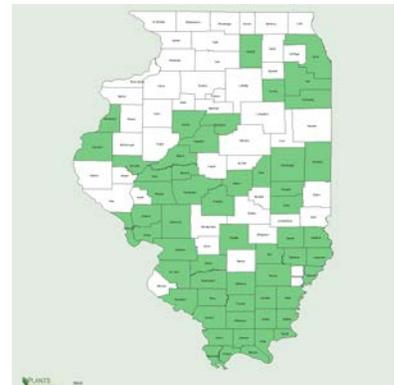
Associates: Plants are self-incompatible. Pollinated by insects directly, wind, or insect mediated wind pollination. Said to attract wood ducks. High deer resistant. Toxic to grazing animals in quantity. No serious insect of disease problems.

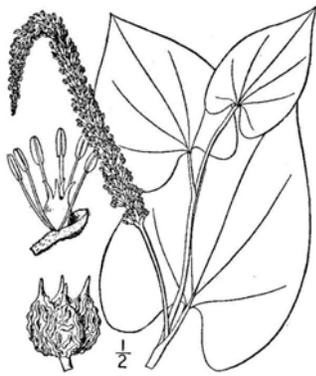
ethnobotany: Sp was used to treat inflammation of the breasts and other portions of the body.

(Lamb/Rhynard).

VHFS: [*Mattuschkia aquatica* JF Gmelin]

A variegated form was discovered near Hertford NC, and is now in the plant trade as *S cernuus* “Hertford Streaker”.





Saururus cernuus showing root growth

Line drawing courtesy of Kentucky Native Plant Society. Photo Robert H Mohlenbrock USDA-NRCS PLANTS Database. - Not copyrighted image. Second line drawing Mark Mohlenbrock, USDA-NRCS PLANTS Database / USDA NRCS *Wetland flora: Field office illustrated guide to plant spp.* USDA Natural Resources Conservation Service. Not copyrighted image. Embryo drawing, fruit & seed photograph by Robert J Gibbons, US National Seed Herbarium images.

[BACK TO TOP](#)

“Why should a botanist study land snails, obviously a part of the zoologist’s grist, & why should he multiply his sins by extending these studies into the geological field? The answer is that in the solution of all problems, & particularly those of a scientific nature, we should make use of all available evidence no matter what the label of the branch under which it technically falls.” Bohumil Shimek 1930.

Endnotes & abbreviations. The following math functions violate Abbey’s 1st Law, which see.

++ The listed numbers are seed count mean, seed count median, seed count mode, seed count standard deviation, seed count max, seed count min, seed count range.

** The listed numbers are Germ mean, germ median, germ mode, germ standard deviation, germ range (range); Dorm mean, dorm median, dorm mode, dorm standard deviation, dorm range (range); Test mean, test median, test mode, test range. (#germ test : tz etc)

Reference abbreviations May 04 2014

CEPPC California Exotic Pest Plant Council
CIPC California Invasive Plant Council
SEPPC Southeast Exotic Pest Plant Council
SWSS Southern Weed Science Society
RBG Kew RBG Kew, Wakehurst Place
aes10 (AES 2010)
afvp (Atlas of Florida Vascular Plants)
anef (Angelo & Boufford: Atlas of New England flora)
apl (Applewood)
asfg (Audubon Society Field Guide)
wade (Alan Wade, nd, various years, 95, &c)
bsh (Baker Seed Herbarium, California)
bb02 (Baskin & Baskin 2002, 2001, &c.)
nlb05 Britton 1905
cb03 (CC Baskin 2003, 2001, &c.)
crfg California Rare Fruit Growers
csvd (Currah, Smreciu, & Van Dyk 1983)
tehn tomclothier.hort.net (-4°C 24°F stratification being corrected)
cu00 (or cu02, &c, Cullina 2000, 2002, 2008)
nd91 (Norm Deno, 1991, 1993)
den28 (Densmore 1928)
do63 (Dobbs 1963)
mfd93 (Mary Fisher Dunham 1993)
dh87 (Dirr & Heusser 1987)
drwfp (Directory of Resources on Wildflower Propagation)
ecs (Ernst Conservation Seeds catalog)
ew12 (Everwilde 2012) also ew11
ewf55 (Egbert W Fell 1955)
ewf59 (Egbert W Fell 1959)
fh (Robert W Freckmann Herbarium)
fna (Flora of North America project)
foc (Flora of China online)
fop (Flora of Pakistan online)
gni (Genesis Nursery, Inc)
gc63 (Gleason & Cronquist 1963, 1991)
gran (Granite Seeds)
he99 (Heon et al 1999)
hk83 (Hartman & Kester 1983)
hpi (Hill Prairies of Illinois
(Hilty website)
Ilpin (Illinois Plant Information network)
jf55 (Jones & Fuller 1955)
jlh (JL Hudson, Seedsman, (if the phone doesn't ring its me))
kpw (Kansas Prairie Wildflowers)
krr (Kenneth R Robertson)
lbj (Lady Bird Johnson Wildflower Center Native Plant Information Network)
m14 (Mohlenbrock 2014) also m86, m99, m02, m05, m06, &c
mbg (Missouri Botanic Garden)
msue (Michigan State University Extension)
nae Native American Ethnobotany (Moerman, University of Michigan Dearborn)
now36 (Nowosad et al 1936)
nyfa (New York Flora Atlas)
orghp (Ontario Rock Garden Hardy Plant Society)
ppc (Philips Petroleum Company)
pots (Plants of the Southwest 2000)

pm09 (Prairie Moon 2009) also pm02, pm11, &c
pnnd (Prairie Nursery no date)
pph (Prairie Propagation Handbook)
ppi (Prairie Plants of Illinois)
psdg (Plants of South Dakota Grasslands)
pug13 (plants.usda.gov accessed 2013, 2014)
oed Oxford English Dictionary online
rain (Ranier Seeds)
rrn97 (Reeseville Ridge Nursery 1997)
rvw11 (Reznicek et al 2011)
rs ma (Ray Schulenburg Morton Arboretum)
rhs Royal Horticultural Society
sh94 (Shirley Shirley 1994) & don't call me Shirley
sk08 (Stuppy & Kessler 2008)
sm23 (Smith 1923) also sm32, sm33, sm28, &c.
sw79 (Swink & Wilhelm 1979)
sw94 (Swink & Wilhelm 1994)
tlp (Time Life Perennials)
tlw (Time Life Wildflowers)
tpg The Prairie Garden
uconn (UConn Plant Database)
us97 (USDA 1997)
w12b (Weakley Nov 2012) also w07-12
wfatp (Vance & Vance 1979)
wfn (Wildflowers of Nebraska)
wfnp Wildflowers Northern Prairies)
ws92 (Wilhelm & Swink 1992)
w73 (Alphonso Wood 1873)
ry64 (Richard Yarnell 1964)
yy92 (Young & Young 1992)
Reliquum etiam non scriptum est.