Magnoliaceae through Ceratophyllaceae of New York State

Richard S. Mitchell
New York State Museum

Ernest O. Beal
Western Kentucky University

Contributions to a Flora of New York State II
Richard S. Mitchell, Editor

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THE UNIVERSITY OF THE STATE OF NEW YORK

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PREFACE

OUR GOAL in producing this series is to present a useful and authoritative account of the plants of New York State. This series of contributions is intended to reflect the knowledge and taxonomic opinions of specialists who prepare the manuscripts, while following a generalized format for consistency. Inclusion of ecological, distributional, medical and economic information on each species is also one of our major aims. Habitat references, flowering times, pertinent synonymy, etc., apply specifically to New York plants rather than to the entire ranges. Complete illustration should facilitate identification of specimens for those who are not formally trained in botany. Descriptions are original, ordered and as complete as possible to provide sequential cross-referencing.

Distribution maps accompany species of seed plants, ferns, mosses, lichens and some groups of fungi. These are plotted by counties to eliminate pinpointing endangered habitats, while offering an accurate visual picture of past collecting. Maps are based on the master file at the New York State Museum, Albany, and supplemented by available data (specimens examined by the authors) from herbaria housing significant New York collections. Specific data or literature citations for any map may be obtained, on approval, from the Museum.

We hope that these bulletins will serve individuals with interest in the flora, as well as to provide information for State and Federal agencies, conservation organizations, industry and the scientific community. With these works go our hopes for the preservation and wise use of a precious and lifegiving resource . . . our State’s plantlife.

Richard S. Mitchell, Editor

The New York State Flora Committee

The steering council of the New York State Flora Committee met for the first time on January 19, 1976, and established as its goals the promotion of study of the State’s plant resources and the publication of this series of Museum Bulletins. These contributions will be continually updated after publication for possible incorporation into larger volumes at a later date.

Members of the council at the time of this publication are:

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George J. Schumacher, Biology Department, SUNY, Binghamton (Algae)
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The classification system employed in this flora is that of Arthur Cronquist (1968), with modifications agreed upon through personal communication.

IMPORTANT NOTE

All economic uses, folklore, medical and pharmaceutical notes, uses as foodstuffs, etc., are compiled from the literature and do not represent an endorsement by the authors or the New York State Museum. Some of the uses may, indeed, be dangerous if incorrectly employed. Some are not effective and are presented for historical interest only.
**LEGEND**

FOR ALL MAPS IN THIS PUBLICATION THE FOLLOWING SYMBOLS APPLY:

- **Solid dot**—specimen seen by author; data on file at the State Herbarium (NYS)
- **Circle**—Field observation with location data and observers name on file (NYS)
- **Hollow triangle**—Literature citation on file (NYS)

FOR ALL ILLUSTRATIONS IN THIS PUBLICATION THE FOLLOWING LETTER-DESIGNATIONS APPLY:

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Magnoliaceae (Magnolia Family)

The Magnoliaceae is a family of ancient lineage, comprising 12 genera and some 200 species. These are primarily native to temperate and subtropical Asia and North America, but some range southward to Java and Brazil. Members of Magnoliaceae are absent in Europe, Africa and Australia. Two species of Magnolia and one Liriodendron are native to New York State. Asiatic Magnolias and their artificial hybrids are quite popular horticulturally, especially section Yulania, known for precocious and spectacular flowers which appear in spring, when plants are virtually devoid of leaves. Tulip-tree (Liriodendron) and several species of North American evergreen and deciduous Magnolia are grown as ornamental shade trees within and outside their natural ranges. The family is also of some importance in North America in terms of wood production.

FAMILY DESCRIPTION

Deciduous or evergreen shrubs and trees. Trunks of some species reach a height of over 40 meters. Bark is ridged with age or scaling and flaking, often aromatic. Stipules are free or adnate to the petiole, and leave conspicuous scars on the twigs. Leaves are simple, pinnately veined, alternate, and sometimes lobed, possessing ethereal oil cells. Flowers are solitary, axillary or terminal, nearly always bisexual. Flower buds are enclosed in 1–3 tough bracts which are deciduous as the flower expands. The perianth is of 5–30 (33) free parts (tepals), spiral or arranged in two or more whorls. The perianth is relatively undifferentiated except in Liriodendron, where sepals and petals are distinguishable. Stamens are numerous, often fleshy or appendaged; anthers 2-locular and longitudinally dehiscent (extrorse or introrse). The stamens spiral on the elongate central axis of the flower, leaving a zone of scars beneath the fruit (either contiguous or not). Ovaries are also spirally arranged on the central axis, each ovary consisting of a free or basally fused conduplicate carpel. Each carpel has 2–6 anatropous, bitégmic, crassinucellar ovules. Fruits are in cone-like aggregates of woody follicles or samaras. Seeds are one to several per fruit with tiny embryos imbedded in copious, oily endosperm.

KEY TO GENERA

1. Leaves acute to obtuse, uncut; flowers not marked with orange; anthers introrse; fruit remaining in a cone-like aggregate of dehiscent follicles, unwinged .................................................................1. Magnolia (p. 1)
2. Leaves truncate, notched and lobed; flowers bicolor, yellow-green with orange marks; anthers extrorse; fruit dry, indehiscent, winged, falling separately .................................................................2. Liriodendron (p. 4)

1. MAGNOLIA

Common Names: Magnolia, Cucumber-tree, Sweet-bay

Authority: Linnaeus, Species Pl. 1, pp. 535–536, 1753

A genus of approximately 80 trees and shrubs, represented in New York State by two native species.

Description: Flowers, bisexual; stigmas 1 per carpel, papillate; styles 1 per carpel, recurved or hooked at tips; carpels numerous, spiraling on the floral axis, each carpel sessile or short-stipitate, cylindric, bearing two ovules, becoming a coriaceous to woody follicle which dehisces along a longitudinal suture; fruits in a cone-like aggregate; seeds 1–2 per follicle (or aborted), remaining temporarily attached to the fruit by vascular threads, drupe-like, with a reddish, leathery to fleshy outer coat and a hard inner layer; stamens spiraling on the axis, numerous, caducous, fleshy, without differentiated filaments, often appendaged at tips; anther sacs introrsely or laterally dehiscent; perianth of undifferentiated tepals; tepals (5) 6–15 (33), broadly oval to linear, greenish-yellow, white, pink, or purplish, similar to one another in size and shape (rarely the outer whorl reduced); flowers solitary, often fragrant, appearing with the leaves or before; flower buds enclosed in spathe-like, glabrous to densely pubescent bracts which drop early, leaving scars on the peduncle; leaves simple, alternate or falsely whorled, evergreen or deciduous, blades coriaceous to fleshy, sometimes basally lobed or emarginate at the apex; petioles thick; stipules caducous, free or attached to the petiole, leaving scars; twigs with mixed winter buds, both vegetative and floral; bark variously ridged or peeling; trunks to 40 m in height; perennial shrubs or trees.
KEY TO MAGNOLIA SPECIES

1. Leaves conspicuously silver-gray beneath; tepals or mature fruiting axes less than 5 cm long.........................1. Magnolia virginiana (p. 2)

1. Leaves pale green beneath; tepals or mature fruiting axes 5–12 cm in length.....2. Magnolia acuminata (p. 3)

1. Magnolia virginiana L.
Common Names: Sweet-bay, Swamp-bay, Magnolia-bay, Bay, Magnolia-laurel, Beaver-tree
Type Description: Linnaeus, Species Pl. I, p. 535, 1753
Synonyms: M. australis Ashe, M. glauca L.
Origin: Eastern North America
Habitats: Swampland, poorly drained coastal plain forests
Habit: Lax shrub or slender tree, late-deciduous to evergreen
Flowering: June–July (September)
Fruiting: July–November
General Distribution: Long Island and Massachusetts coast south to Florida, west to Texas

Description: Flowers bisexual; stigmatic surfaces punctate on reflexed styles, 1 per carpel; ovaries numerous, each a conduplicate carpel, greenish, glabrous, spirally arranged, ca. 1 cm long, cylindric, each becoming a short-beaked, ellipsoid follicle; follicle 1–2 cm long, reddish to purple-brown at maturity; fruiting-cone ellipsoid, 3–5 cm long; seeds 0–2 per follicle, ovoid, 0.8–1.1 cm long, red; stamens few, 8–9 mm long, with acute appendages; tepals spatulate to orbicular, 3–5 (9) cm long, white to cream colored, appearing with leaves, 6–15 (18) in number, the outer 3 usually reflexed, the inner ones forming a subglobose flower; flower 3–5 cm long, white to cream colored, fragrant, opening with the leaves; bud scales sericeous; peduncle stout, 1–2 cm long, glabrous to sericeous; leaves alternate, late-deciduous (evergreen further south), narrowly oblong to oblong-elliptic or lanceolate, 4–11 (17) cm long, 2–5 (6.5) cm broad, acute tipped, cuneate to acute at bases, upper surfaces bright green, glabrous or finely pubescent, copiously sericeous on lower surfaces with a silver-gray sheen (rarely greenish); petioles yellow-green, 1.5–2 (3) cm long; stipule scars extending nearly to the lamina base; twigs glabrous to densely sericeous, greenish becoming purple-brown with age; pith strongly septate; winter buds sericeous; bark of trunk and older limbs gray-brown, flaking and forming furrowed plates; branching system open, lax; trunks up to 1 m (d.b.h.), 30 m in height. (2n = 38).
Infraspecific Variation and Hybridization: Differences in deciduousness and persistence of pubescence on leaves, petioles and twigs have been used to separate southern var. *australis* Sarg. from ours. These characters are quite variable and seem to represent a rough longitudinal cline. Multiple trunked, shrub-like habit prevails in some locations, and may either be genetically fixed or environmentally induced. Hybrids are recorded between this species and: *M. hypoleuca* Sieb & Zucc., *M. macrophylla* Michx., *M. tripetala* L., *M. grandiflora* L. and *M. guatemalensis* J. D. Smith.

Importance: The wood is used in furniture manufacture for both structural components and face-veneer. The plant is sometimes cultivated as a moisture and shade-tolerant tree.

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2. *Magnolia acuminata* (L.) L.

Common Names: Cucumber-tree, Mountain Magnolia, Cucumber Magnolia

Type Description: Linnaeus, Syst. Nat. ed. 10, vol. 2, p. 1082, 1759


Origin: Eastern North America


Habit: Straight, slightly buttressed trunk, pyramidal crown, and spreading root system; scattered trees, rarely forming stands

Flowering: May–June

Fruiting: July–September

General Distribution: New York and southern Ontario south in the highlands to Alabama (Louisiana) and west to Oklahoma
Description: Flowers bisexual; stigmatic surfaces punctate on the early-deciduous, recurved styles, 1 per carpel; ovaries numerous, free, spirally arranged, each of a single conduplicate carpel about 2.5 cm long; each carpel becoming an unbeaked, rounded-obtuse follicle, dehiscent along a longitudinal suture, pinkish, becoming red-brown at maturity; fruit aggregate oblong to cylindric (or asymmetrical due to abortion), up to 8 cm long; seeds 0–2 per follicle, 0.9–1.1 cm long, glossy, red-orange at maturity; stamens numerous, spirally arranged on the floral axis, about 1 cm long; filaments distinct; tepals oblanceolate to oblongate, 2 cm (outer) to 12 cm (inner in length, the outer 3 sepaloid, reflexed, the inner 6 petaloid, forming a slenderly campanulate flower; flower 5–10 cm long, glaucous green, tinged with yellow and occasionally purple (sometimes bright yellow further south), appearing with the leaves, borne on stout, peduncles which are copiously villous and 1.5–3.2 cm long; leaves alternate, deciduous, thin, often membranous, 8–25 (40) cm long, 4–10 (20) cm broad, elliptic to oblong with acuminate (rarely obtuse) tips and truncate to cuneate bases, upper surfaces dark green, glabrous to puberulent, lower surfaces pale, glabrous to finely pubescent, slightly glaucous or sericous near the veins; fall coloring yellow; petioles about 3 cm (1.5–5.0) long, silvery-sericeous to almost glabrous, with basal stipular scars; leaf scars horseshoe-shaped; twigs reddish-brown to tan, glabrous except at nodes, lenticellate; pith not conspicuously diaphragmed; winter buds silky-sericeous, silvery, oblong, the terminal ones cylindric reaching 2 cm in length; bark of the trunk and older limbs gray-brown to dark brown, fissured into narrow, flaky ridges; branching pattern forming a broadly to narrowly pyramidal crown; trunks up to 1.5 (2) m (d.b.h.), 35 (40) m in height. (2n = 76).

Intraspecific Variability and Hybridization: Most of the variability of this species occurs in the southern part of its range. Plants with clear, golden, inner tepals are designated forma aurea (Ashe) Hardin. Plants called var. subcordata (Spach) Dandy may also have yellow flowers, but these are distinguished by more pubescent twigs and leaf undersurfaces (see Hardin, 1954). Hybrids with M. quinquepeta (Buc'hoz) Dandy have been given the binominal M. brooklyensis Kalmbacher.

Importance: This species is the hardiest of our native Magnolias. It is commonly cultivated and used as rootstock for less hardy species. Grafting allows these to be grown far north of their natural ranges. The wood (often mixed with that of Tulip-tree) is used in furniture manufacture and in making fixtures, blinds, crates and boxes, doors and pulpwod.

Introduced Species: Magnolia tripetala L., Umbrella-tree, is native further south, and has been introduced northward, where it is hardy to Massachusetts. We have one specimen from Southold, Long Island for which there are insufficient data to determine its origin. M. fraseri Walt. is reported as an adventive in a Sullivan County nursery, where it was introduced with a shipment of Rhododendron from North Carolina.

2. LIRIODENDRON

Common Names: Tulip-tree, Yellow Poplar, Tulip Poplar

Authority: Linnaeus, Species Pl. I. p. 535, 1753

A genus of two closely related species of eastern North America and southern Asia. Fossil records indicate widespread past distribution of the genus over North America and Eurasia. Our native Liriodendron is a tall, distinctive tree, valuable for its timber and as an ornamental.
1. *Liriodendron tulipifera* L.

**Common Names:** Tulip-tree, Yellow Poplar, Tulip Poplar, White-wood

**Type Description:** Linnaeus, Species Pl. I, p. 535, 1753

**Synonyms:** *Tulipifera liriodendron* Mill. (also misspelled Liriodendron) *L. procerum* Salisb.

**Origin:** Circumboreal Arctotertiary Forest

**Habitats:** Moist, but well drained, loose-textured soils of medium depth; a successful secondary invader of forest habitats, lime tolerant and more moisture tolerant southward; found in a broad spectrum of forest types, from Oak-Hickory to coniferous mixtures.

**Habit:** Tall, straight trunk, terminating above the open, oblong, deciduous crown; root system deep, wide-spreading.

**Flowering:** May–June

**Fruiting:** July–October

**General Distribution:** Vermont to northern Florida, west to Michigan, Missouri and Louisiana (cultivated elsewhere)

**Description:** Flowers bisexual; stigmas 1 per carpel, often reflexed at the style tip; styles 1 per carpel, flattened, tapering; ovaries numerous, imbricated, spiraling on the central **floral axis**; each ovary of a single conduplicate carpel, greenish-yellow, squamelliform, becoming an elongate samara in **fruit**; samara 4–5 cm long, 4–5 mm wide, acute tipped; seeds 1–2 per indehiscent fruit; **fruit aggregate** deciduous as a unit, fusiform, 5–7.5 cm long, pale tan to brownish, the lowermost fruits often persistent on the axis; **stamens** numerous, spiraling on the axis, up to 4 cm long, the **filaments** distinct, shorter than the **anther sacs** and stout; **perianth** differentiated into **calyx** and **corolla**; **sepal s** 3, greenish, reflexed, about 6 cm long, cuculate, blunt-tipped; **petals** 6, in two whorls, strongly upcurved, often reflexed in the terminal cm, 4–6 cm long, 1.5–3.1 cm broad, pale green to bright yellow, each petal banded with a distinctive orange mark near the base; flowers borne singly, broadly campanulate, 6–10 cm wide, on short shoots; **peduncles** stout, greenish; **leaves** alternate, deciduous, usually saddle-shaped, with two acute to acuminate tipped upper lobes and two lower lobes with one or two such tips; lobing variable, especially in juvenile leaves which may be deeply cleft or barely lobed at all; **leaf bases** truncate, tips truncate to emarginate,
blades bright green above to glaucous below, 10–15 cm in diameter; fall coloring lemon-yellow; petioles slender, 5–15 cm long; stipules elongate (up to 3.5 cm), deciduous, encircling the twig and leaving distinct scars; twigs stout, glabrous, lenticelled, red-brown to gray with exfoliation; pith strongly diaphragmed; terminal buds up to 1.5 cm long, with a "duck-billed" appearance; outer 2 bud scales enclosing the bud entirely, valvate; leaf scars circular to oval; bark of young trunk and older limbs with characteristic, whitish split-depressions in the grayish surfaces; older bark gray-brown, deeply furrowed; trunks straight, becoming massive with age, terminating above the oblong crown, up to 4.5 m (d.b.h.), to 55 m (record 198 ft) in height. (2n = 38).

Infraspecific Variation: Other than natural heterophyll displayed in native populations, most variation in this species has been exhibited only in cultivation. This involves leaf variegation, flower color variants, leaf and crown shape.

Importance: This is one of the most beautiful cultivated trees native to North America. Its unusually graceful habit, showy flowers and fall coloring far outweigh the "dirty" aspect of shedding fruit aggregates. Although it is not an outstanding shade producer, the tree is fast-growing and mixes well with other species for landscaping effects. The wood is pale (called Whitewood and Poplar in the trade) and is an important commodity with many uses. It is well suited for rotary-cut veneering, used in furniture, plywood production, piano cases and produce boxes; it is also a source of pulp (soda process). The wood is used structurally for furniture manufacture, for doors, blinds, crates, caskets, musical instruments, wooden utensils and toys.

Annonaceae (Custard-apple Family)

A large pantropical family of woody plants with over 800 described species and 60–80 genera. Annona (including Uvaria) is the largest genus with nearly 200 species. One Custard Apple, (Annona glabra L.) is native to southern Florida, and others are cultivated for their fruit and as ornamentals. Asimina (Pawpaw) has two native species, one of which reaches western New York State. The Pawpaw fruit is both picked for food and planted as a novelty in the eastern United States.

FAMILY DESCRIPTION

Trees or shrubs. The alternate leaves are persistent or deciduous, without stipules and with naked buds in the axils; flowers are usually bisexual, and are radially symmetrical, differentiated into calyx and corolla and valvate in bud. Sepals are 3; petals 6, in 2 whorls. The central floral axis is elongate with numerous adnate, extrorse stamens spiraling on it. Anther sacs are 4-celled, longer than the filaments. Ovaries are superior, terminating the axis, 1–many, usually 1-carpelled, 1-loculed, becoming berries, cohering to form a fleshy aggregate fruit (or solitary). Ovules are 1 to many per ovary, anatropous, maturing to seeds which have a minute embryo and copious ruminate (mottled) endosperm.

1. ASIMINA

Common Name: North American Pawpaw

Authority: Adams, Fam. Pl. II, p. 365, 1763

A genus of some 8–10 species of subtropical and boreal eastern North America, with one species extending northward onto the Erie-Ontario Lowlands in western New York.
1. *Asimina triloba* (L.) Dunal

**Common Name:** Pawpaw

**Type Description:** Dunal, Mon. Anon., p. 83, 1817

**Synonyms:** *Annona triloba* L., *Orchidocarpum arietinum* Michx., *Porcellia triloba* Pers., *Uvaria triloba* Torr. & Gray

**Origin:** Eastern North America

**Habitats:** Rich alluvial soils, woodlands, openings

**Habit:** Shrub or small tree

**Flowering:** April–May

**Fruiting:** August–September

**General Distribution:** Western New York and southern Ontario to eastern Nebraska, south to eastern Texas and central Georgia, with outliers in north Florida and southern Louisiana

**Description:** Flowers bisexual; stigma and style 1 per carpel; ovaries 3–15, fusiform, on the elongate floral axis, only 1–3 (4) developing into fruit; fruit 6–15 cm long, 3–4.5 cm thick, yellowish to purple-brown, fleshy, edible; ovules parietal, becoming (4) 6–10 disc-shaped seeds, 1–2 cm in diameter; endosperm mottled and chambered; embryo small; stamens numerous, on the column, in a globose, adhering mass, 6–11 mm in diameter; anther sacs adnate until anthesis, extrorse; filaments very short; perianth differentiated into three whorls; inner petals valvate in bud, velutinous, narrowly oblong to strap-shaped, 1.5–2.3 cm long, 5–10 mm wide, dark reddish-purple; outer petals 3, imbricate in bud, velutinous, as broad or broader than long, 1.5–2.1 cm, lurid purple, occasionally blushed with yellow-green; calyx of 3 sepals, deciduous, red-brown adaxially woolly, ca. 1 cm long, peduncles 6–8 mm long, arising from wood of the previous year’s growth, covered with reddish-brown wool; flowers solitary, cauliflous, alternate on the stem; leaves alternate, simple, entire, deciduous, densely woolly when very young; leaf blades 10–32 cm long, 6–13 cm wide, appearing with the flowers and almost fully expanded by anthesis, glabrous to velutinous, especially below, paler beneath, obtuse to cuneate at bases, obtuse to rounded, acute apiculate to strongly cuspidate at tips (caudate); midrib grooved above, woolly within the groove; petiole with a strong, woolly groove adaxially, 0.5–3.0 cm long; stipules absent; buds small, reddish-woolly; twigs densely woolly, reddish-brown to gray-brown, less pubescent with age, sometimes fluted and ridged; older bark grayish, mottled, smooth to warty and flaking; trunks 5–30 cm (d.b.h.), usually shrubby; trees with closed, oval crowns occasionally to 11 m in height, from spreading root systems.

**Importance:** This species is planted for its fleshy, edible fruits. The pulp is whitish to yellow and has a sweet, fruity taste at maturity. The bark of young twigs is sometimes used by fishermen as a stringer for their catch. Seminole Indians reportedly make a tea from the flowers to help kidney discomfort.
Calycantheceae (Calycanthus Family)

This group of evergreen or deciduous shrubs has two genera and about 6–7 species, all found in warm-temperate regions. *Chimonanthus* is native to Asia while *Calycanthus* is represented in California and in the southeastern United States. Members of the family in New York State are found as escapes from cultivation only, being native further south. Their economic importance is limited to minor use as ornamental shrubs. This primitive family has a curious mixture of characters which places it in the order Magnoliales, but shows clear affinities for the Rosales as well.

**FAMILY DESCRIPTION**

Plants are shrubby, with evergreen or deciduous, opposite, simple leaves. Petioles are short and lack stipules. The fragrant flowers are borne (solitary) in the leaf axils; they are bisexual, the perianth undifferentiated, or grading into sepal-like bracts below. Tepals are free, showy, spiraling on a cup-like perigynous receptacle. Stamens are 5–30 or more, inserted on the inner surface of the receptacular cup; anthers are adnate, extrorse, 2–celled; filaments are distinct but short, the inner ones sometimes devoid of fertile anther sacs. Ovaries are 1–loculed, each of a single carpel, numbering 8–22, "superior" to the receptacular cup, which surrounds and virtually encloses them. Styles are filiform, with a single minute stigma each. Placentation is parietal; ovules are 1 or 2 (with one aborting). The fruit is an achene, enclosed with others in the fleshy, mature receptacle. The embryo is large with convolute cotyledons, and endosperm is lacking.

1. **CALYCANTHUS**

Common Names: Sweet-shrub, Carolina Allspice, Strawberry-shrub, Bubby-shrub

Authority: Linnaeus, Syst. Nat., p. 1066, 1759

A genus of aromatic shrubs native to eastern and western North America. *Calycanthus occidentalis* Hook & Arn. is the native California "Spice-bush," while up to three species have been recognized as native from the Appalachian Plateau southward. The following species is cultivated and escapes New York State.
1. Calycanthus floridus L.

Common Names: Sweet-shrub, Strawberry-bush, Bubby-bush

Type Description: Linnaeus, Syst. Nat., p. 1066, 1759

Synonyms: Calycanthus fertilis Walt., C. laevigatus Willd., C. oblongifolius Nutt., C. nanus (Loisel.) Small, C. glaucus Willd., C. mohrii Small, Butneria florida (L.) Kearney, B. fertilis (Walt.) Kearney

Origin: Eastern North America

Habitats: Rich woodlands, floodplains and uplands

Habit: Round-crowned, somewhat stiffly branched shrub

Flowering: April—July

Fruiting: July—September

General Distribution: Pennsylvania south to peninsular Florida, west to Mississippi, cultivated elsewhere (escaping in New York)

Description: Flowers bisexual; stigma 1, style 1, ca 2 mm long, transparent, filiform, with a ring of acicular hairs at the base; ovaries 10–15 (20), free, each of a single carpel ca. 1 mm long; carpels inserted on the inner surface of a cup-like receptacle which is lined with transparent, acicular hairs; each carpel with 1 (2) ovules, becoming a single-seeded achene in fruit, enclosed with the others in the accrescent, fruit-like receptacle; stamens numerous, spiraling on the rim of the floral cup, just inside the perianth, forming a crown-like cluster above the ovaries; anther sacs extrorse; filaments stout, arching over the gynoecium, the connective extending beyond the anther sacs; staminodes present in the inner ring of stamens; perianth parts free and numerous, spiraling on the rim of the receptacular cup; when young they are greenish, pubescent, leaf-like, enlarging as the flower matures to become glabrous, strap-shaped to lanceolate tepals, 1–2.5 cm long, 5–10 mm wide, rose-carmen to maroon and brownish with age, the outer few smaller, greenish; flower sometimes subtended by one or two bracts (transitional to tepals); flowers with a fragrance like strawberries (typical variety) or nearly odorless; peduncles 4–10 mm long, puberulent; flowers borne singly between leaves on short, lateral shoots; leaves opposite, simple, entire, aromatic; leaf blades glossy green, scabrous to glabrescent above, pilose or sericeous below, to glabrous, ovate with obtuse to acuminate tips, 2–10 cm long, 1–7 cm broad; petioles 1–2 cm long, pubescent at least when young; stipules absent; twigs reddish-brown with pale, oval lenticels; leaf scars V-shaped; buds very small, pubescent; bark of older trunks dark, red-brown to blackish, stripping; stems erect to spreading, stiffly opposite-branched with a rounded crown, up to 3 m high, from a shallow root system.
Importance: This species is widely cultivated in the eastern United States, showing tolerance for more severe climates than its natural range would suggest; shade tolerant. The bark of the typical variety has been used as a spice, however, var. laevigatus has been reported to contain substances which cause regurgitation in humans and poison animals. Indians used a mild extract as a detergent to the return of disease symptoms such as fevers. Fruit and leaves of the fragrant variety have been used as a perfume.

KEY TO VARIETIES

1. Leaves covered with soft hairs on the undersurfaces; flowers strongly fragrant ......... 1. C. floridus var. floridus
1. Leaves with glabrous, sparsely strigulose or glaucous undersurfaces; flowers without a strong odor............... 

do. The name laevigatus is apparently preceded by a Nuttall epithet which would replace it, but we have not seen the type or a formal recombination, and feel it would be inappropriate here.

Lauraceae (Laurel Family)

This is a large, mostly tropical, family of trees and shrubs, with 35-40 genera. At least ten of these have species which are native or escaping in the United States. New York has Lindera, Spice-bush, and Sassafras as natives, and Persea, Red Bay, as an introduction. On the west coast Umbellularia, California Laurel, is native, and four tropical genera are indigenous to southern Florida. Laurus nobilis L., Grecian Laurel, and Persea americana Mill., Avocado, as well as Cinnamomum camphora (L.) Nees & Eberm., the Camphor-tree, are widely escaped from cultivation in subtropical and mediterranean climates. Many Lauraceous trees are known for their aromatic bark and foliage (e.g., commercial cinnamon). They are commonly used in spices, teas and folk remedies. The bark of Sassafras is used to make a tea and as a flavoring in gumbo.

FAMILY DESCRIPTION

Woody trees or shrubs with deciduous or evergreen leaves. Leaves, bark and wood usually contain aromatic oils. Stipules are absent. Leaves are usually alternate, simple, sometimes lobed, with pinnate venation or three main, arching veins from near the leaf base. Flowers are bisexual or more commonly unisexual on dioecious or polygamous plants; flowers are in clusters, spikes racemes or umbels, which are usually axillary. The perianth is undifferentiated, with (4) 6 tepals in 2 similar whors, usually small, greenish to yellow (or white), fused into a short tubular base. Stamens are 12, in 4 whors, often reduced to staminodia in inner whors. Outer stamens associated with stalked glands in many species. Anthers are 2- or 4-celled, dehiscing by flaps. The ovary is solitary, superior or fused slightly to the perianth tube, and of a single carpel, which becomes a single-seeded drupe or berry. The fruit base is often ringed by the enlarged remains of the perianth tube. The single ovule is anatropous, becoming a seed which lacks endosperm.

KEY TO GENERA

1. Plants evergreen; flower clusters appearing in the leaf axils of young growth.................... 3. Persea (p. 13)
1. Plants deciduous; flower clusters appearing before or with the leaves...........................................(2)
2. Flowers in small, sub sessile clusters, less than 1 cm in diameter; leaves not lobed; fruit red.............
2. Flowers in racemes 3-5 cm long; leaves often mitten-shaped or bilobed; fruit dark purple..............

1. LINDERA

Common Names: Spice-bush, Wild Allspice, Feverbush
Authority: Thunberg, Nov. Gen. Pl., p. 64, 1783 (nom. cons.)

A large genus of shrubs and trees with over 100 temperate and subtropical species. Although the group is primarily Asiatic, there is one widespread, eastern North American species which reaches New York State. Another native species is extremely rare with a more southerly range.
1. *Lindera benzoin* (L.) Blume

Common Names: Spice-bush, Benjamin-bush, Fever-bush

Type Description: Blume, Mus. Bot. Lugd.—Bat. I, p. 324, 1851


Origin: Ancient Acrctotertiary Forest of North America

Habitats: Moist woodlands in rich soils and litter

Habit: An erect to sprawling understory shrub or small tree

Flowering: March–May

Fruiting: June–July

General Distribution: Maine to Florida, west to Kansas and Texas

Description: Plants polygamodioecious or dioecious; stigma 1, on a short style; ovary 1, globose, becoming an elliptic-oblong drupe; fruit scarlet (rarely yellow), 8–10 mm long, 5–7 mm wide; seeds without endosperm; stamens (male flowers) 9, in 3 whorls, the inner filaments glandular at the bases and 1–2 lobed, variously reduced to staminodia in carpellate flowers, anther sacs 2-locular, 2-valved; perianth undifferentiated, with 6 separate tepals in 2 whorls, yellow to greenish or brown-tinged without, 1–2 mm long; peduncles obscure in flower, attaching the subsessile perianths, becoming stout, 2–6 mm long in fruit; inflorescences of dense, umbellate clusters of 4–6 flowers, each subtended by 4 red-brown deciduous bracts; staminate clusters 5–6 mm in diameter, occurring alternately near the tips of new growth; pistillate clusters solitary or often paired just above the former year's leaf scars; leaves alternate, ovate-oblong to obovate, 6–18 cm long, 2–7 cm wide, glabrous, rich green above, paler beneath, margins entire, bases acute to cuneate, tips (obtuse) acute to abruptly acuminate; fall coloring pale yellow; petioles 3–11 mm long, glabrous; stipules absent; twigs brownish-gray to black, smooth with a few ovate, pale lenticels; leaf scars broadly deltoid; vegetative buds minute, 0.5–0.8 mm, smooth, brown; flower buds subglobose, 1–2 mm long; branching profuse near branch tips; bark brownish, aromatic; a broad-crowned shrub, up to 4.5 m tall, from a shallow, spreading root system. (2n = 24).

Infraspecific Variation: Plants in the southeastern United States with pubescent twigs and underleaves have been given varietal status, but intergrade with nonpubescent populations. Forma *xanthocarpa* (G. S. Torrey) Rehder, with yellow fruits, is a mutant native to Massachusetts.

Importance: The aromatic bark has been used in medicinal teas like Sassafras, and the bitter component is said to reduce fevers and sinus congestion. It is listed as a stimulant, diaphoretic and vermifuge. During revolutionary times, berries were powdered and substituted for allspice in cooking. The plants are occasionally cultivated in shady yards, including the yellow-fruited form.
2. SASSAFRAS

Common Names: White or Red Sassafras


A genus of three species, two Asian and one in eastern North America. The asiatic species are not known in cultivation, but the American species is grown within and outside its natural range. It is valued for its aromatic bark and roots, but becomes weedy in the southeast.

1. Sassafras albidum (Nutt.) Nees

Common Names: Sassafras, White-sassafras

Type Description: C. G. Nees, Syst. Laurin., p. 490, 1836

Synonyms: Laurus sassafras L., Sassafras officinale

Origin: Ancient Arctotertiary Forest

Habitats: Mesic to dry, open woodlands, thickets, borders, openings and fencerows

Habit: An open-crowned, usually slender tree or shrub, propagating by root sprouts

Flowering: April–June

Fruiting: June–August

General Distribution: Southwest Maine to eastern Iowa, south to eastern Texas and central Florida

Description: Plants dioecious; female flowers: stigma 1, slightly expanded from the single, slender style; ovary 1, becoming an ovoid, blue to purple-black drupe, 0.8–1.2 cm in diameter; a single, pendulous, anatropous ovule becomes the stony pit or seed; rudimentary staminodia 6–12 in whorls of 3; male flowers: ovary tissue rudimentary, sterile; stamens 9, in 3 whorls; both anther sacs 2-loculed, 2-pored; filaments inserted at the perianth base, the inner 3 with pairs of stalked glands; perianth (both sexes) undifferentiated, with 6 lobes, free to near their bases, greenish-yellow, 5–8 cm long; pedicels 5–25 mm long, silky pubescent to glabrous, becoming stout and reddish in fruit, swollen just below the fruit base; each pedicel usually subtended by a linear, pubescent bract in flower; inflorescence a compound raceme (often corymbose) of 2–several axes, each 3–7 cm long, the cluster subtended by a leathery involucre of bracts and bud scales; basal bracts oval to strap-shaped with rounded tips, rosetted, glabrous to finely sericeous; plants heterophyllous; leaves alternate, deciduous, aromatic; leaf blades oval to elliptic, unlobed, mitten-shaped or 2-lobed (rarely more), 7–15 (20) cm long, 5–15 cm broad, shallowly to abruptly cuneate at the bases, the lobes and tips acute to obtuse, bright green above, glaucous, paler beneath, essentially glabrous to puberulent (silky); fall color yellow to orange-rose blushed or spotted; petioles 1–5 cm long, often pu-
berulent; *stipules absent; twigs* red-brown, the younger ones fluted, becoming shiny, mucilaginous; *lenticels* punctate, dark; *leaf scars* kidney-shaped with a linear bundle scar; *buds* minute, with imbricated scales, shiny-glabrous; *bark* of the trunk deeply furrowed with age, brown to grayish, aromatic; *trunks* usually small but up to 1 m (d.b.h.), 1–20 (40) m tall, from a prolific *rootstock* capable of root-bud propagation. \(2n = 48\).

**Infraspecific Variability:** Pubescence of leaves and twigs is variable, the more silky plants having been designated var. *molle* Fern. Twig color also may vary from greenish to red-brown or bright red-purple in forma *moldenkii* Oswald.

**Importance:** Sassafras extract has been reported as a potential carcinogen in experimental rats (Kapadia, *et al.*, 1978). The oily, aromatic foliage, bark and roots have been variously used to make teas and tonics. The extract is one of the ingredients in root beer. The oil is used in aromatic soaps. Sassafras teas are popular, especially in rural areas. Fílé gumbo is a delightful southern dish prepared from young shoots pith and bark of the Sassafras in combination with rice and chicken or shrimp. The wood is of minor importance, sometimes mixed with Black Ash (*Fraxinus nigra* Marsh.) or sold under its name. Used locally, it is employed in small-boat construction, children’s furniture and troughs and pales for rails and fenceposts. The plant is an invader of old fields and abandoned lots where land once was cultivated, or it is commonly spread by birds, appearing first along fencerows and under telephone lines. The plants are cultivated, but are more often pests in the southeastern United States, where root suckering is common and dense, shrubby stands abound.

# 3. PERSEA

**Common Names:** Red Bay, Sweet-bay

**Authority:** Miller, Gard. Dict. Abr. ed. 4, 1754 (nom. cons.)

A genus of over 100 tropical and subtropical shrubs and small trees, naturally ranging south to Chile and northward to the eastern seaboard of the United States. Red Bay (*P. borbonia*) has been reported to escape cultivation in New York State. Avocado (*P. americana*) can produce summer shoots from seed, but these do not persist.

1. *Persea borbonia* (L.) Spreng.

**Common Name:** Red Bay

**Type Description:** Sprengel, Syst. II, p. 268, 1825

**Synonyms:** *P. littoralis* Small (also combinations under *Borbonia* Mill. and *Tamala* Raf.)

**Origin:** Eastern North America

**Habitats:** Wooded swamps and marsh borders of the southeast, rarely escaping northward

**Habit:** Evergreen shrub or small tree

**Flowering:** June–July

**Fruiting:** July–September

**General Distribution:** Delaware south to Florida and the Bahamas, west to Texas in the coastal zone and piedmont (escaping here)
Description: Flowers bisexual; stigma 1, style 1, ovary single, ovoidal, becoming a subglobose, fleshy, purple-blue to black drupe, 8–12 mm in diameter; ovule 1, becoming a single, stony pit in seed; stamens 12, the innermost of 4 whorls reduced to sterile, glandular staminodia; anther sacs 4 per stamen, each 2-locular, opening by valvate pores, the outer whorl extrorse, the inner two fertile whorls introrse; filaments with basal glands; perianth of 6 separate tepals in 2 whorls, 2.8–3.5 mm long, greenish to white; bell-shaped calyx pubescent without, flaring as it dries and becoming persistent in fruit; pedicels slender, 0.2–1.6 cm long, becoming thicker and densely reddish-pubescent in fruit; inflorescences borne in the leaf axils, cymose with several flowers borne from the common peduncle which is 1–6 cm long and villous to woolly-sericeous; leaves evergreen, alternate, coriaceous, leaf blades bright green above, paler beneath, finely to densely pubescent or almost glabrous above, 4–10 (15) cm long, 1–6 cm wide, elliptic to lanceolate or obovate, with obtuse to cuneate bases and obtuse to acuminate tips; petioles 1–3 cm long, villous to appressed-wolly; stipules absent; twigs usually densely woolly-sericeous with appressed red-brown hairs, their bark brown with oval, scale-like lenticels; leaf scars irregular; buds densely pubescent; bark of older limbs and trunks deeply furrowed, dark brown, aromatic; trunks up to 18 cm (d.b.h.) and a height of 12 m, usually shrubby, from a shallow rootstock. (2n = 24).

Infraspecific Variation: The plants vary mostly in density of hairs on the twigs and leaves, the commoner type being forma pubescens Fern.

Importance: The shrub is cultivated north and west of its range, but not extensively. The aromatic leaves have been used as a substitute for bay leaf in cooking. The wood is hard, red-brown and brittle, sometimes used in cabinetmaking and boat trim.

Saururaceae (Lizard's-tail Family)

A distinctive group of five genera of primitive, herbaceous perennials, native to Asia and North America. This family is distributed in the remnants of the once-circumboreal Arctotertiary Forest, where it probably originated. Of the two native genera, Anemopsis is restricted to west coast, while Saururus has one species in Asia and one in eastern North America. Members of this family are found in a variety of moist habitats, especially Saururus, which often occurs as an emergent aquatic.

FAMILY DESCRIPTION

Plants are perennial, stoloniferous and/or rhizomatous, with alternate, simple leaves. They have ethereal oil glands in the stems and leaves. Stems are jointed, with ± sheathing petioles. Flowers are bisexual; stigmas and styles are 1 per carpel; carpels are conduplicate, 3–4 (5) per flower, free to near the base to almost totally syncarpous. Fruits are dry to fleshy, indehiscent. Ovules usually 2 per carpel, orthotropous. Seeds have a well-developed perisperm, but little endosperm surrounding the tiny embryo. Stamens are 3 or 6 (8), inserted below or on the carpels. A perianth is lacking, but the racemes or spikes may have petaloid to foliaceous bracts. Inflorescences are terminal or opposite the leaves.

1. SAURURUS

Common Name: Lizards-tail

Authority: Linnaeus, Species Pl. I, p. 341, 1753

A genus of two species aquatic herbs with one representative in the eastern United States.
1. *Saururus cernuus* L.

**Common Names:** Lizard's-tail, Water-dragon, Swamp-lily

**Type Description:** Linnaeus, Species Pl. I, p. 341, 1753

**Synonyms:** *Spathium* Lour., *Saururus* Turcz., *Mattuschka* Gmel., *Neobiondia* Pamp.

**Origin:** Obscure, possibly Arctotertiary lowlands

**Habitats:** Shallow water or muck of swamps, lake margins, river backwaters

**Habit:** Erect perennial, rhizomatous herb, often aquatic-emergent

**Flowering:** June–September

**Fruiting:** July–November

**General Distribution:** Southern New England to Michigan, south to eastern Kansas, Texas and Florida, mostly in lowlands

**Description:** Flowers bisexual; stigma 1 per carpel, 2-crested, linear with an open groove between crests, covering the inner surface of the style and reflexed with it at the tip; style 1 per carpel, fleshy, reflexed outward; each ovary a conduplicate carpel; carpels usually 4 per flower (3–5), spirally arranged, fused only at their bases, becoming convoluted, warty and brownish in fruit; fruit 2–3 mm long, each an indehiscent nutlet; ovules 2, crassinucleate, orthotropous, with two integuments, one ovule transverse, not developing, one ascending, becoming a solitary seed; seed with a filmy outer coat and brownish inner one, developing a massive *endosperm* beneath a small *embryo* at the micropylar end; stamens usually 6 (4–8), 3 abaxial and 3 adaxial to the carpel cluster on the foliar bract; filaments 3–4 mm long, capillary, giving the flower its whitish color, much exceeding the ovaries; anther sacs elliptic, basifixed, yellowish, opening by longitudinal slits; perianth absent, the floral parts being inserted on a laterally divergent bract; floral bract pubescent, cucullate, about 2 mm long; inflorescences of terminal or lateral, racemose spikes, 8–35 cm long, with 150–350 fragrant flowers spiraling on each axis; spikes drooping at the tips in flower, becoming erect in fruit; peduncles glabrous, 2–5 cm long; leaves alternate, simple and aromatic, blades cordate with obtuse to acute tips and entire margins, ± palmately veined, 5–15 cm long, 3–8 cm broad, glabrous, glossy green above, paler, below; petioles about half as long as the leaves, sheathing at the bases by adnate (stipular) tissue; nodes jointed; internodes sulcate with 7–9 ribs; stem 40–100 cm in height from a pale, branching *rhizome* system; roots adventitious at the nodes. (2n = 22).

**Importance:** The plants are freely cloning and highly competitive in aquatic ecosystems, possibly crowding out some other species entirely under certain conditions. They are infrequently cultivated on wet ground. Mashed and boiled roots were applied as a poultice by Choctaw Indians; the extract is listed as a sedative, antispasmodic and astringent.
Aristolochiaceae (Birthwort Family)

Primarily a tropical and subtropical group of lianas, subshrubs and herbs, this family has few members scattered in boreal regions. Two genera, Aristolochia and Asarum reach North America. One Asarum species and one of Aristolochia are native to New York State, while three more Aristolochias escape cultivation here. The plants are known for various uses in conventional and folk medicine, mostly in the past. Dutchman's-pipe, Birthwort and Wild Ginger are valued as ornamentals. The bell or trumpet-shaped flowers are noted for their purple to lurid greenish-yellow color combinations, and some produce a fetid odor. Aristolochia flowers trap insects overnight and shed pollen on them the following day as they seek their escape.

FAMILY DESCRIPTION

Our native genera have bisexual flowers which are regular or bilaterally symmetrical. They are solitary, or borne in clusters or in loose racemes in the leaf axils. Stigmas equal the number of locules (6 in ours) of the single ovary which is wholly or partially inferior. Styles are united to form a column, with the 6-12 stamens, free (Asarum) or adnate to it (Aristolochia). Petals are absent. The calyx is conspicuous, petaloid, campanulate or tubular-contorted, 3-lobed. The fruit is a septicidal, 6-lobed or angled capsule or an indehiscent berry. The anatropous ovules may become compressed seeds which may bear caruncles. Endosperm is copious and embryos are minute. Leaves are cordate to triangulate-sagittate, rarely broadly linear; they are alternate and distichous. The stems are prostrate, twining or erect, the herbaceous members copiously rooting.

KEY TO GENERA

1. Flowers campanulate, radially symmetrical; stamens 12; stems prostrate, producing two leaves annually per node................................................................................................................................................1. Asarum (p. 16)
1. Flowers tubular-contorted, bilaterally symmetrical; stamens 6; erect herbs or twining vines with leafy stems........................................................................................................................................2. Aristolochia (p. 17)

1. ASARUM

Common Names: Wild Ginger, Asarabacca, Asarette (Quebec), Wild Nard

Authority: Linnaeus, Species Pl., p. 442, 1753

A genus of herbs, distributed circumboreally, primarily in the southern remnants of the Arctotertiary Forest of Eurasia and North America. Over 60 species have been described, mostly from eastern Asia. A single species is widespread in the rich woodlands of New York State, where it exhibits a wide polymorphism. A group called Heartleafs is closely related, but of more southerly distribution (sometimes segregated as Hexastylis). The genus Asarum is known throughout the North Temperate area for its uses in folk medicine, and it is cultivated occasionally as a curiosity or ground cover.
1. *Asarum canadense* L.

Common Names: Wild Ginger, Asarabacca, Canadian Ginger, Indian Ginger, Canada Snakeroot

Type Description: Linnaeus, Species Pl. I, p. 442, 1753


Origin: Eastern North America

Habitats: Humus-rich, moist soils and leaf litter of forest floors and slopes

Habit: Sprawling, perennial, rhizomatous herb, forming clonal colonies

Flowering: April–June

Fruiting: June–August

General Distribution: Gaspé Peninsula to Minnesota, south to Arkansas and North Carolina

Description: Flowers bisexual; stigmas 6; styles 6, cohering to form a furrowed column; ovary 1, fusiform, 6-chambered, with many anatropous ovules, its ventral walls fused to the calyx, becoming a 6-locular berry with strongly caruncled seeds; berry 0.6–1.8 cm in diameter, enclosed in the persistent calyx and opening irregularly with age; stamens 12, free, their bases inserted on the ovary; connectives projecting beyond the anther sacs as subulate tips; minute, subulate, rudimentary stamens inserted alternate to the lobes within the calyx; petals absent; calyx regular, 2–5 cm long, fused with the ovary below, campanulate, strongly 3-lobed and cleft above, dark to dusky red-purple, yellowish- to greenish-tinged within, densely villous with sepal trichomes which are sparser within the flower; calyx tips ascending to spreading (or reflexed), deltoid to acuminate, caudate tipped or merely apiculate; peduncle densely villous, 1–5 cm long; flower solitary, borne between two leaves; leaves cordate, reniform to orbicular, 3–8 (12) cm long (from the sinus), 5–15 (21) cm wide, with rounded to obtuse apex, surfaces minutely hispid to pilose along major veins, dark to pale green, sometimes brown- or purple-mottled; petioles 5–20 (28) cm long, weakly to strongly villous; stem prostrate, annually bearing 2–3 scarious scales and 2 leaves, fragrant, freely rooting.

Infraspecific Variation: A number of varieties have been named on the basis of calyx characters. Those with calyx lobes gradually tapering to caudate tips have been called var. *acuminatum* Ashe. The more distinctive var. *reflexum* (Bickn.) Robins. is linked with the typical variety by intermediates designated var. *ambiguum* (Bickn.) Farw. In its typical form, var. *reflexum* has deltoid calyx lobes which are strongly reflexed. Forma *phelpsiacae* of St. Lawrence County, New York is a population in which leaf sinuses are fused.
Importance: Roots, rhizomes and leaves have an agreeable odor, suggestive of ginger, and have been used in small quantities in seasoning; roots have been boiled in a thick sugar-syrup as a delicacy. In any quantity, Wild Ginger has medicinal effects, however. Powder and tonics have been used as emetics, mange cure, and a source of brown dye in Europe; in North America, medicinal uses have included heart stimulation, treatment of arrhythmia and chest pains, promotion of menstruation, relief of bowel spasms and treatment of throat ailments; it is listed as a stimulant, carminative, diuretic and diaphoretic; extracted principles include a volatile oil used in perfumes, camphor-like azorone, asarin, a bitter component, resin, mucilage, alkaloids and aristolochic acid, known to have antimicrobial properties and retard certain kinds of cancer in mice. Root tinctures were used by American Indians to treat ear infection, and early European settlers in the New World learned to mix the powder with bark scraps as a deterrent to tooth decay.

2. ARISTOLOCHIA

Common Names: Birthwort, Dutchman's-pipe, Pine-vine, Serpentry, Virginia Snakeroot

Authority: Linnaeus, Species Pl., p. 960, 1753

A large genus of vines, herbs or subshrubs, distributed pantropically, with some species reaching temperate regions. Of the four species reported in New York, only one is native to the State, where it is a rarity, as well. Two of the three naturalized species are native to the southeastern United States. Pipe-vine and Dutchman's-pipe are cultivated as trellis plants. The genus Aristolochia derives its name (which translates, "best delivery" from Greek) from medicinal powers which allegedly give aid in childbirth.

Description: Flowers bisexual; stigmas 3 or 6, forming lobes or crown-like projections on a single, thick stylar column or gynostemium; ovary wholly inferior, 6-loculed, elongate, externally similar to the peduncle, becoming a septicidal capsule; placentation axile; seeds numerous, compressed, with copious endosperm; corolla absent; calyx conspicuous, purple to lurid, yellow-green or mottled, tubular to pipe-shaped, bilaterally symmetrical by virtue of irregular twisting and lobing, with a basal chamber or utricle, and a tube which flares at its distal end into an unevenly lobed limb; the throat of the limb may bear an annulus, and the junction between utricle and tube of some species is elaborated into a syrinx (absent in ours); inflorescences pseudofascicular by crowding, or flowers borne singly in leaf or bract axil, often on short, lateral, fertile shoots; pedicels often associated with bracts or reduced leaves; leaves alternate, simple, linear-sagittate to cordate-ovate, long-petioled, estipulate; stems woody, twining, or erect to lax herbs, somewhat woody at base, from perennial rootstocks. Vines twine clockwise (left to right).

KEY TO SPECIES OF ARISTOLOCHIA

1. Flower tube nearly straight; flowers clustered in the leaf axils .......................... 1. Aristolochia clematitis (p. 19)
2. Plants herbaceous, never twining; flowers in scaly-bracted cymes from the plant base ................................................................. 2. Aristolochia serpentaria (p. 20)
3. Peduncles and flowers densely tomentose; peduncular bract absent ................................................................. 3. Aristolochia tomentosa (p. 21)
4. Aristolochia macrophylla (p. 22)
1. *Aristolochia clematitis* L.  

Common Name: Birthwort  

Type Description: Linnaeus, Species Pl. II, p. 962, 1753  

Origin: Southern Europe  

Habitats: Waste places, old lots, roadsides as an escape  

Habit: Erect herbs  

Flowering: June–August  

Fruiting: August–October  

General Distribution: European (introduced locally in North America)  

Description: Flowers bisexual; stigma of 6 pointed lobes; styal column thick, short; ovary 6-celled, inferior, becoming a subglobose to cylindric capsule, 2.5–3.1 cm long, dehiscing basipetally along 6 longitudinal sutures; seeds numerous, flattened, 10 mm long, 12 mm wide; stamens 6, sessile on the column, equidistant; petals absent; calyx tube straight or only slightly curved; utricle flared near its attachment to the ovary, yellow-green to purplish-tinted; tube narrowing, weakly reflexed to form a narrowly deltoid to trullate, purplish limb; limb 0.8–1.4 cm long, calyx 1.3–2.1 cm total length, glabrous except for a few small hairs on the utricle base; peduncles about 5 mm long, persistent; inflorescence of axillary fascicles of (1) 2–8 flowers; leaves broadly cordate to reniform, 4–11 cm broad, auriculate with large, incurved and occasionally blunt lobes, tips obtuse to rounded, (leaves) 2–8 cm long, from the sinus, palmately veined with a strongly reticulated venation system between, essentially glabrous; petioles glabrous, ridged, 2–6 cm long; pseudostipules absent; nodes estipulate, but often with persistent peduncles in the axils; internodes sulcate and sharply ridged; stems up to 1.5 m tall, erect to spreading from a tough, perennial rhizome.  

Importance: Extracted aristolochic acid has been used as a bacterial and fungal retardant; in Europe the highly diluted crude extract has been used for colds, chills, fevers and asthma. Concentrated extracts of any *Aristolochia* may be harmful to the digestive tract and lethally poisonous if administered indiscriminately.
2. **Aristolochia serpentaria** L.

Common Names: Virginia Snakeroot, Serpentary


Type Description: Linnaeus, Species Pl. II, p. 961, 1753

Origin: Eastern North America

Habitats: Rich, often calcareous soils, woodlands and floodplains

Habit: Erect or ascending herb, often bearing its flowers among leaf litter

Flowering: Late May–July

Fruiting: July–October

General Distribution: Connecticut and southern New York to Florida, Texas and Missouri

Description: Flowers bisexual; stigma 6-lobed; styrall column fleshy, ca. 1.5 mm high; ovary 1, inferior, becoming a spheroid capsule, 0.8–1.5 cm in diameter, deliscing basipetally along 6 longitudinal sutures; seeds relatively few, 4–5 mm long, ellipsoid with acute tips, each borne on a prominent funicular stalk which attaches within a sinus; seed surfaces are yellowish, pebbly, giving the superficial appearance of grape pits; stamens 6, connivent, roughly paired; petals absent; calyx irregularly curved to form an S-configuration, 0.8–1.4 cm total length; utricle subglobose; tube variously swollen, flared at the distal end into an unevenly lobed limb; outer calyx sparsely to densely matted-pilose, especially toward the utricle; syrinx slightly developed, inequilateral; limb madder-purple, 3-lobed with a smooth, ring-like annulus; fertile branches ("peduncles") 2–9 cm long, scaly, wiry, arising alternately from near the plant base, bearing 1- (2–several) flowers each; peduncle scales alternate, 2-several per stalk, sessile-hastate, pubescent, 1–4 mm long; leaves membranous, heteromorphic; upper leaves alternate, distichous, ovate-lanceolate to linear-hastate or cordate at bases, 4–15 cm long, 2–8 cm broad, sparsely puberulent; lower leaves abruptly reduced, grading into scales below; petioles longest on middle to upper leaves, 0.4–2.5 cm long; pseudostipules absent; internodes minutely pubescent; stems 8–50 cm tall, branching at the bases, erect or ascending, arising from a short rhizome with a dense fibrous root system.

Infraspecific Variation: The shape and lobing of leaves may vary from one population to another or even on individuals. Plants with strongly divergent basal lobes on narrowly attenuate leaves have been given both species and varietal ranks (see synonymy). Cleistogamous flowers have been described, in which the calyx tube does not develop normally, but remains as a small cap.
Importance: Like other *Aristolochia* species, it is suspect in livestock and human poisoning, but the plants are rare and cases are rarely reported. Aristolochic acid (yellow bitter-principle), resinous aristinic acid and a volatile oil have been extracted from this species; moderate doses of extract are said to act as a gastric stimulant, and may aid in dyspepsia; however, large doses are known to overstimulate, causing upset and dysentery. The principle was commonly mixed with barks of various trees and made into a medicinal tea; Indian lore recommends a root extract to check vomiting; folk uses and claims are numerous, but not well documented, including treatment for bilious, typhus and typhoid fevers, small-pox, pneumonia, amenorrhoea and septisemic fevers; its use after snakebite is apparently as a fever retardant. Its reputation as a panacea is highly suspect, not recommended in modern medicinal practice.

3. *Aristolochia tomentosa* Sims

Common Name: Woolly Pipe-vine
Type Description: Sims, Bot. Mag., pl. 1369, 1811
Synonyms: *A. hirsuta* Muhl., *A. tripteris* Raf., *A. coriacea* Raf., *A. hitchcockii* Gandoger (also combinations under *Siphisia*, *Isiphia*, *Hoquartia*, *Isotrema* and *Dasyphonion*)
Origin: Eastern North America
Habitats: Moist, alluvial woods and calcareous bottom-lands
Habit: Twining, woody, perennial vine, becoming a high-climbing liana
Flowering: June–July
Fruiting: August–November
General Distribution: Illinois to Florida, west to Texas (escaping cultivation in New York State)

Description: Flowers bisexual; stigma 6-lobed; styrar column fleshy, ca. 3 mm high; ovary 2–2.5 cm long, inferior, well-developed in flower and distinguishable from the pedicel, densely tomentose without, becoming a large, woody capsule (4.5–8 cm long, 1.5–2.5 cm wide) which dehisces along 6 longitudinal sutures; seeds numerous, flattened, caruncled, 0.8–1.0 mm long and broad; stamens 6, adnate to the styrar column in pairs; petals absent; calyx cindric, somewhat inflated at the utricle; tube strongly curved upward, yellowish, tomentose, with an abruptly flared limb; limb purple, 1.3–1.7 cm across, 3-lobed, the lower lobe slightly larger; annulus prominent, rugose, nearly closed at the throat; pedicels 1.5–3.1 cm long (or short, bearing an undeveloped flower) on densely tomentose, short, lateral shoots, 1–4 cm long; the joint usually bears a tomentose reduced leaf which is less than 1 cm in length; bud scales at the shoot base tomentose beneath, minute; inflorescences are of 1–2 flowers per shoot, borne singly; leaves are broadly cordate to reniform, with obtuse to rounded tips, 3–10 (20) cm long, 2–8
(15) cm broad, densely tomentose below, less pubescent above; petioles tomentose, 1–4.5 cm long; pseudostipules absent; nodes somewhat enlarged with a tuft of hairs at the base of each short shoot; internodes slightly fluted, glaucous to puberulent, reddish beneath; stems woody, twining, up to 25 m from a perennial rootstock.

Importance: Cultivated outside its range in the United States, Canada and Europe as an arbor or trellis plant.

4. Aristolochia macrophylla Lamarck

Common Names: Dutchman's-pipe, Pipe-vine
Type Description: Lamarck, Encycl. Meth. Bot. 1, p. 255, 1783
Synonyms: A. durior Hill, A. sipho L'Her., A. frutescens, Marsh, A. grandifolia Salisb., A. arkansaw Lodd., (also combinations under Hoquartia, Siphisia, Isipha and Isotrema)
Habitats: Rich woodlands and streambanks in upland environments
Habit: Twining, high-climbing, woody liana
Flowering: June (New York)
Fruiting: August–November
General Distribution: Pennsylvania (Connecticut) to northern Alabama in the Appalachian uplands, cultivated and naturalizing northward to New York

Description: Flowers bisexual; stigma 6-lobed, stylar column fleshy, about 4 mm high; ovary 1, inferior, not conspicuous in flower, slightly furrowed, glabrous, developing into a large cylindric capsule, 5.5–10 cm long, 1.5–5.8 cm wide, valvate-dehiscent along 6 longitudinal sutures; seeds numerous, cordate-flattened, caruncled, 0.6–1.0 cm long; stamens 6, adnate to column, paired; petals absent; calyx with a flared utricle, the tube curved abruptly upward, 2–2.5 cm long, narrowing toward the apex, yellowish, often mottled, essentially glabrous, expanded abruptly into a limb; limb 3-lobed, madder-purple, the upper two lobes acute, the lower blunt-obtuse, 2–2.5 cm broad; pedicels 2–4 cm long, glabrous, on slender, lateral shoots 1–3 cm long; bract at their joint foliaceous, sessile, puberulent, 1–3 cm long and wide, cordate-clasping; leaves cordate, ovate to reniform with acuminate tips, 10–45 cm long and broad, minutely pubescent beneath, especially on the veins; petioles puberulent to glabrous, 3–8 cm long; pseudostipules absent; nodes somewhat enlarged, internodes reddish, variously ribbed and thickened, glabrous; stem climbing up to 20 m from a perennial rootstock.

Importance: This is a popular cultivated plant in the United States and especially in Europe where it is not an uncommon sight covering columns, trellises and lamp posts. It is grown primarily for its climbing properties and lush foliage; propagated from cuttings.

Note: According to Pfeifer (1962, 1966) the commonly used binomial, A. durior, is based on an illustration of poor quality which more closely resembles Bignonia capreolata.
Nymphaeaceae (Waterlily Family)

As treated herein, the Nymphaeaceae consists of the genera *Nymphaea*, *Nuphar*, and *Ondinea*, the latter being described in 1970 from northwestern Australia. Three genera native to New York State, which have been ascribed to Nymphaeaceae in the past, are treated as separate families: *Nelumbo* (Nelumbonaceae), *Brasenia* and *Cabomba* (Cabombaceae). Still other genera, not native to New York State, are also considered to belong to separate families; thus *Victoria* and *Euryale* (Euryalaceae) and *Barclaya* (Barelayaceae) are not included in the family description. Since *Ondinea* has unusual characteristics (3–5 carpels, epigynous stamens, no petals), and is also not native to this continent, its characters are omitted as exceptions. Depending on the author involved, *Nymphaea* can be considered to have about 40 species and *Nuphar* as many as 25. However, only one polymorphic species of *Nymphaea* occurs in our area, and the most recent treatment of *Nuphar* (Beal, 1956) reduced the number of species in North America and Europe to one, with several subspecies and intergrading clinal series. Of these, three subspecies and their intermediates occur in New York State. Members of the Nymphaeaceae and their hybrids are popular in cultivation. They are also important as wildlife food and in the light and shelter dynamics of aquatic ecosystems.

**FAMILY DESCRIPTION**

Members of Nymphaeaceae are aquatic, colony-forming perennials. Rhizomes range from slender to massive (sometimes tuberous) with thick, adventitious roots throughout, and petioles and peduncles are arranged spirally, appearing tightly clustered near their tips with the decay of dead tissue. Leaves are submerged, floating or emergent, passing through a series of submerged forms in early development. Mature leaves are orbicular to oval with a sinus (rarely slightly peltate) to sagittate, glossy green above, paler green to red-purple, much-veined below. Petioles are elongate, fleshy. Flowers are perfect, radially symmetrical, floating or emergent. They are solitary on long, stiff peduncles (which recoil after fertilization in *Nymphaea*). Flowers of *Nymphaea* are persistent at the water surface for several days during which time they grow in size, opening and closing daily. Perianth parts (excluding staminodia) 4–40 free, white or yellow (blue, pink) to greenish or maroon, not strongly differentiated into calyx and corolla in *Nymphaea*. Stamens are numerous, spirally arranged, attached to the carpellary wall or hypogynous, introrse; anther sacs are two in number. Stamens grade into petal-like staminodia in *Nymphaea*. Carpels are numerous, partially or wholly fused. Each conduplicate carpel contains numerous anatropous ovules which vary in lateral union and attachment to the carpel wall. Stigmatic areas are exposed on a radiate disc. The margins fuse early in *Nuphar* but late in *Nymphaea* (not at all in some *Nuphar* mutants) emphasizing their conduplicate origin. Seeds are numerous within each carpellary unit of the fruit; they are operculate, with or without an aril. Fruits are leathery berries, dehiscing into pips near the water surface (*Nuphar*) or submerged on the recoiled peduncles (*Nymphaea*). Each seed has a straight embryo and starchy to albuminous endosperm.

**KEY TO GENERA**

1. Perianth parts (tepals) snowy white (to pinkish), the outer 4–5, ± sepaloid; carpels partially fused, the stigmatic areas individually curved inward; stamens perigynous on the carpellary wall; seed arillate; leaves mostly orbicular, lobes pointed at the tips .................................................................1. *Nymphaea* (p. 23)

2. Perianth parts yellow to green (often maroon), clearly differentiated into outer and inner series; carpels completely fused, the stigmatic areas on a lobed or entire disc; stamens hypogynous; seeds not arillate; leaves orbicular to hastate, the lobes rounded .................................................................2. *Nuphar* (p. 25)

1. Nymphae

Common Names: Water-lily, Pond-lily, Nymphaea, Fragrant Water-lily, White Water-lily, Bonnet

Authority: Linnaeus, Species Pl., p. 510, 1753

A genus of perhaps 40 species distributed primarily in the Northern Hemisphere. Many species are highly prized as ornamentals, and variability is extensive, even among our "native varieties." The timing of opening and closing of flowers is apparently dependent on the specific clone involved. Fruits and seeds are sought out by diving birds, where they lie near the bottom, entangled in the recoiled peduncles.
1. *Nymphaea odorata* Ait.

**Common Names:** White Water-lily, Fragrant Water-lily, Pond-lily, Nymphaea, Sweet-scented Water-lily, Rose-colored Water-lily, Bonnet

**Type Description:** Aiton, Hort. Kew. 2. p. 227, 1789


**Origin:** Eastern North America

**Habitats:** Ponds, slow streams, quiet lakes and sloughs

**Habit:** Rhizomatous, sometimes tuberous, aquatic, herbaceous perennial with mostly floating leaves and flowers; forming extensive colonies

**Flowering:** June–September

**Fruiting:** Late June–November

**General Distribution:** Newfoundland to Manitoba, northern Minnesota and Michigan to Florida, Texas, Mexico and El Salvador

**Description:** Plants with bisexual flowers; stigmas 10–25 per flower, forming a radiate disc, with sterile tissue extending upward as a crown of slender, incurved appendages; **ovary** 1, consisting of 10–25 partially fused **carpels**, becoming a leathery **berry**, 2.5–3.5 cm in diameter in fruit; **ovules** numerous, anatropous, variously fused to the carpel wall; **seeds** arillate and operculate, ellipsoid, 1.5–4.4 mm long; **embryo** in a pocket near the hilum; cotyledons large, enfolding the **plumule**; **endosperm** albuminous to thick, starchy, enclosed in copious **perisperm**; stamens 60 or more, introrse; **anther** sacs elongate, upcurved; **filaments** attached basally to the **hypanthium** surrounding the ovary; petaloid **staminodia**, 1–4 cm long, intergrading with the tepals of the perianth; **perianth** radially symmetrical, consisting of numerous, inner, white to pinkish **tepals**, 2–9 cm long, 1.5–3.5 cm wide, elliptic-lanceolate to spatulate with acute to rounded tips, grading into a few (usually 4) greenish to purple **sepal-like lobes**; flowers solitary, floating or emergent, often fragrant, 7–25 cm broad, open from morning to early afternoon; **peduncles** smooth, fleshy, up to 3 m long, greenish to purple; leaves mostly orbicular to oval in outline, 4–50 (60)
cm in diameter, with a sinus to the petiole and pointed, basal lobes, pale to dark green, waxy above, often purple to pale red beneath, essentially net-veined with a few major laterals arising from the midrib; petioles arising with the peduncles on the rhizome, greenish to purple or with longitudinal, brown stripes; rhizomes slender to thick, fleshy and starchy, sometimes tuberous and serving to propagate certain clones; roots fleshy, adventitious. (2n = 56 or 84 in large, southern forms).

**Infraspecific Variation:** Of the many other described taxa in this genus, we have *N. odorata* f. *rubra* Guillot and “*N. tuberosa*” in New York State. The former is an escape from cultivation which has naturalized in a few areas. The concept of *N. tuberosa* has received considerable acceptance and attention, due to the large number of obvious characters ascribed to it. It has been characterized as tuberous, with large leaves, greenish beneath, brown striped petioles, large, odorless flowers which stay open longer, green sepals, numerous, broader, spatulate-rounded petals, narrower anther sacs on inner filaments, few carpels and seeds and short arils. Numerous field observations as well as population and transplant studies have confirmed the erratic distribution and clustering of these traits (Monson) 1957–58; Williams, 1970). Although clones are known which concentrate certain character-combinations, the array of such combinations is extensive. Most northern populations appear to be tuberous to an extent, relying on this means of propagation more than on seeds. Further study of this group is called for, especially comparing northern and southern representatives of the species-complex.

**Importance:** *Nymphaea odorata* has long been cultivated and encouraged where it naturally occurs in North America. Its horticultural introduction into England in 1786 is said to have aroused much interest in Water-lily cultivation throughout Europe (Sculthorpe, 1967). It is the traditional lily pad of literature and folk songs of the North American continent. It is still prized as an aquatic ornamental, though many more exotic cultivars have been bred. It is considered a weed in situations where it clogs waterways or adds to silts in ponds. It is a valuable shelter and attachment for small animals and algae, and the seeds are eaten by waterfowl. Rhizomes and tubers are extremely starchy, and may be utilized as human food. Indians of the north central states used the pulp in bread-making. The tubers are sought out as food by wild hogs and deer.

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2. **NUPHAR**

**Common Names:** Yellow Pond-lily, Spatter-dock, Yellow Water-lily, Cow-lily

**Authority:** J. E. Smith in Fl. Graec. Prodr. I, p. 361, 1808–09 (nom. cons.)

A genus of highly variable plants, limited to the Northern Hemisphere. Some authors recognize as many as 25 species (and literally hundreds of infraspecific taxa) with up to 18 of these occurring in the United States and Canada. The most recent treatment (Beal, 1956), supported by subsequent experimental evidence (Beal & Southall, 1977), recognizes one species throughout North America and Europe with 9 subspecies. It is that treatment which will be followed here.

1. **Nuphar luteum** (L.) Sibth. & Smith

**Common Names:** Yellow Pond-lily, Spatter-dock, Yellow Water-lily, Cow-lily

**Type Description:** Linnaeus, Species, Pl., p. 510, 1753 (in part)


**Origin:** Eurasia (but long native to North America)

**Habitats:** Ponds, lakes, sloughs, streams, bogs and occasionally on wet mud

**Habit:** Strictly rhizomatous perennial herb, forming clonal colonies

**Flowering:** May–October

**Fruiting:** June–November

**General Distribution:** Temperate to subtropical and subarctic areas of the Northern Hemisphere

**Description:** Flowers bisexual; stigmatic areas borne on a radiate, deeply crenate to entire stigmatic disc, 0.5–5 cm in diameter, the 5–36 stigmatic rays extending to within 4 mm of the disc margin and often to the margin; style 1, very constricted to about the same diameter as the stigmatic disc, green, yellowish and/or variously tinged with maroon; ovary 1, the carpels completely fused, 5–36 chambered, with numerous ovules per chamber, up to 8 cm
long in fruit; seeds operculate, not arillate, 2.5–5 mm wide and up to 5 mm long; stamens numerous hypogynous, with ventral anthers 1–10 mm long, usually with sterile tissue extending (up to 4 mm) beyond the anthers; corolla represented by small (up to 10 mm long) yellowish to maroon petals in a spiral arrangement immediately external to the stamens; calyx radially symmetrical, conspicuous, the 5–14 sepals relatively large, 1–4.5 cm long, greenish, often yellowish and/or maroon on the ventral surface (and sometimes both the ventral and dorsal surfaces). 1.5–12 cm in diameter when fully expanded; flowers solitary on elongate, spongy peduncles up to 3.5 m long; leaves submersed, floating or emergent, the blades ranging from wider than long (essentially orbicular) to as much as 5 times as long as wide, up to 6 dm in length or in diameter, with divergent to overlapping blunt-tipped basal lobes, glabrous to densely pubescent beneath, the major veins arising from the midrib; petioles glabrous to pubescent, up to 3.5 m in length, arising (along with adventitious roots and peduncles) from the nodes of the rhizome; rhizome 1–15 cm in diameter. (2n = 34).

**Infraspecific Variation:** Variation among clonal populations and between subspecies is exceptionally great; however, variation within clones is minimal. Sterility has been reported among plants intermediate between ssp. *puinulum* and ssp. *variegatum* [often known as *Nuphar rubrodiscum* Morong, *Nymphaea rubrodisca* Greene, *Nymphaea hybrida* Peck, *Nymphozanthus rubrodiscus* (Morong) Fern., *Nuphar × hybridum* (Peck) Berg., or × *Nuphar rubrodiscum* (Morong) Fern.], as well as complete fertility in some populations. It may well be that sterility is less prevalent than previously reported, in view of experimental evidence involving intermediates of ssp. *macrophyllum* and ssp. *sagittifolium* in North Carolina (Beal and Southall, 1977), in which the intermediates would not germinate without vernalization but, upon appropriate vernalization treatment, germinated equally as well as their supposed parental subspecies.

Subspecies *macrophyllum* and ssp. *variegatum* are the most tenuously delimited taxa in the genus. In areas where their ranges are parapatric, the presumed distinctive features blend and intergrade with no apparent sterility of the intermediates. As one progresses northward from “macrophyllum territory” into “variegatum territory,” the petioles become more flattened and more broadly winged. Also the inner surfaces of the sepals and the carpels become more consistently maroon. In fact, in this treatment of *Nuphar luteum* in New York, only those plants lacking both winged petioles and maroon coloration have been treated as ssp. *macrophyllum*. All other combinations have been treated as ssp. *variegatum*.

A specimen of *N. luteum* ssp. *variegatum* was collected from a lily pond, Sag Harbor, Suffolk County by Boy Latham (No. 6792) in 1929. This plant has a leaf length-width ratio of almost 2, reminiscent of the intermediates between ssp. *macrophyllum* and ssp. *sagittifolium* in the Carolinas. Undoubtedly, should this population still exist, it should be possible to experimentally extract genotypes comparable to the more southern coastal form, ssp. *sagittifolium*. In fact, experimental studies comparable to those done in the Carolinas, should throw much light upon the genetic nature of the subspecies and their intermediates in New York.

A single specimen of *N. luteum* (Muenscher and Curtis, 5083, CU) from Highland Lake, New York, has the typical leaf shape and numerous sepals of ssp. *polystepulum*. It also has the winged petiole characteristic of ssp. *variegatum*. This suggests either extreme polymorphism in ssp. *variegatum* or the ephemeral past establishment of ssp. *polystepulum* with subsequent introgression.

**Importance:** The seeds and rootstocks are well-documented food sources for wildlife and man. The most extensive use of seeds has been by northwestern Indians who parch them (*N. luteum* ssp. *polystepulum*) and grind off the tough hulls. Subspecies *variegatum* has been used in New York and New England where seeds were boiled. Eastern Indians primarily ate rhizomes, after boiling, for their high carbohydrate content. Early reports claim the taste of sheep-liver and state that Indians dive for the “rootstocks” or “stole them from muskrats.”

**KEY TO SUBSPECIES**

1. Fruit narrowly constricted below the stigmatic disc; stigmatic disc deeply crenate or dentate; anthers mostly 1–2 mm in length; sepals usually 5; petals mostly thin and broadly spatulate............la. *N. luteum* ssp. *puinulum*

1. Fruit only slightly, if at all, constricted below the stigmatic disc; stigmatic disc crenate to entire; anthers mostly 5–8 mm long; sepals usually 6 (–9); petals mostly thick and oblong...............................(2)

2. Petiole conspicuously flattened and winged on the upper surface; sepals (and carpels) often maroon colored..

2. Petiole terete to oval in cross-section, without wings; sepals usually green and/or yellow on the inner surface; carpels green to yellow............................................................1b. *N. luteum* ssp. *variegatum*

1c. *N. luteum* ssp. *macrophyllum*
1a. *N. luteum* ssp. *pumilum* (Timm.) Beal
Type Description: Timm. Mag. Nat. Meckl. 2, p. 250, 1795
Origin: Eurasia (Native also in North America)
General Distribution in North America: Northeastern Minnesota northward into Newfoundland and southward to southern New Jersey.

1b. *N. luteum* ssp. *variegatum* (Durand) Beal
Type Description: Engelm. ex Durand in Clinton, 19th Annual Report of the Regents of The University of the State of New York on the Condition of the State Cabinet of Natural History. p. 73. 1866
Origin: Northeastern North America
General Distribution: New Jersey to northeastern Pennsylvania, northern Ohio, northern Indiana, northern Illinois, Iowa, Nebraska, and western Montana, northward to the Yukon, Northwest Territories (Great Bear & Great Slave Lakes), northern Alberta, northern Saskatchewan, northern Manitoba, Quebec (as far north as Hudson Bay) and Newfoundland.

1c. *N. luteum* ssp. *macrophyllum* (Small) Beal
Type Description: Small, Bull, Torrey Bot. Club 25:465–466. 1895
Synonyms: *Nymphaea lutea* sensu Walter, *Nymphaea advena* Ait. (in part), *Nymphaea advena* sensu Michx., *Nymphaea arifolia* Salisb. in Konig & Sims, *Nuphar advena* Ait. f., *Nuphar advena*
Nuphar luteum (L.) Sibth. & Smith. The three subspecies native to New York State are illustrated above, designated as follows: A-1, ssp. pumilum; A-2, ssp. variegatum; A-3, ssp. macrophyllum. Flowers of hybrid intermediates ("× N. rubrodiscum") between the two varieties at the left are also shown (F-4).

Origin: Eastern United States
General Distribution: From western Cuba to northeastern Mexico, northward to Maine, southern Vermont, New York, southern Ontario, central Michigan, southern Wisconsin, Missouri, southwestern Nebraska, eastern Oklahoma and eastern Texas

Note: The complete and more accurate author citation for ssp. variegatum would be (Engelmann ex Durand in Clinton) Beal, referring to the extremely confusing situation in which: 1) Clinton was the valid publisher, though remaining anonymous 2) Durand furnished the description, as quoted by Clinton 3) Engelmann was the first to use the epithet, but was said by Clinton to doubt the species at the time. We have employed Recommendation 46D of the International Code in choosing Durand to be retained as author of the description in its entirety.

**Nelumbonaceae (Lotus Family)**

This is a monogenic group of primitive, strictly rhizomatous, aquatic plants, consisting of three species. One, *Nelumbo lutea*, a yellow-flowered species, is native to eastern North America and extends southward to Colombia; another *N. nucifera*, is native to the warmer parts of Asia and Australia and has pink flowers. The third species (if distinct) is native to the West Indies. The family, on both morphological and immunological grounds, is of uncertain relationship to other families. Authors have treated *Nelumbo* variously, placing it in the body of Nymphaeaceae with *Cabomba* and *Brasenia*, or placing it in a distinct subfamily, Nelumboideae; still others, more recently, are consistently separating it as a distinct family or even order. The bulk of evidence from the literature places its relationships away from the Nymphaeaceae, closer to some monocot families. Lotus is widely cultivated as an aquatic ornamental. There is considerable doubt that the genus *Nelumbo* is the biblical *Lotus*, though the tubers are edible.

**FAMILY DESCRIPTION**

Plants have large, bisexual, radially symmetrical flowers, borne above water level. These are solitary on long, stiff peduncles which arise from the nodes of underwater rhizomes. Carpels (9–39) are separate, enclosed in round pits at the upper, flat surface of a spongy, obconical receptacle. Each short style is tipped with a small, obconical stigma. Stamens are free (±200), fairly well differentiated into long, ventral anthers and filaments which are basifixied spirally and hypogynously. Outer stamens exhibit increased sterile tissue, but there is an abrupt transition from stamens to petals. Petals are numerous, spirally arranged, early-deciduous, grading into 2–5 more or less persistent sepals. The fruit is an indehiscent nut with a hard pericarp. The pendulous ovule is anatropous. The ovule comes to fill the entire pericarp where, in seed, the embryo is enclosed by a thin, membranous sheath (sometimes interpreted as endospermy). Endosperm and perisperm are absent. A ring around the base of the green plume becomes 2-lobed, suggesting the presence of one cotyledon rather than two. Leaves of the plume are peltate, closely resembling more mature leaves. Seedlings float on the surface of the water. Rhizomes are 1–2 cm thick, but produce enlarged, starchy tubers in late season. Peltate leaves (3–6 dm wide) are both floating and emergent, borne on long petioles which arise from nodes of rhizomes as do adventitious roots. Fruits are nut-like, borne in the enlarged receptacle which is woody, obconical and flat-topped, dropping the fruit from open chambers in its surface. The peduncle often reflexes just below the fruiting receptacle. Vegetative portions of the plant are without vessels (except primary xylem of roots) and vascular bundles are scattered, suggesting monocotyledonous relationships.
1. **NELUMBO**

**Common Names:** Lotus, Sacred Bean

**Authority:** Adans, Fam. Pl., vol. 2, p. 76, 1763

These plants are aquatic herbs of circumboreal distribution, known for their large, peltate leaves and edible fruits and tubers. There are three species, one of which is known to have persisted after escape from cultivation in New York State.

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**Common Names:** Lotus, Wankapin, American Lotus, Duck-acorn, Yanquapin, Water Chinquapin, Lotus-lily, Water-nut, Can-dock, Yellow Nelumbo

**Type Description:** Persoon, Syn. vol. 1, p. 95, 1805

**Synonyms:** Nelumbium luteum Willd., Nymphaea pentapetala Walt., *Cyhan luteus* Nutt., Nelumbo pentapetala (Walt.) Fern.

**Origin:** Eastern North America

**Habitats:** Ponds, lakes, slow streams, estuaries, artificial impoundments and sloughs

**Habit:** A large, perennial, aquatic herb with floating and emergent leaves

**Flowering:** July–September

**Fruiting:** September–November

**General Distribution:** Florida to Texas and northward inland to Iowa, Minnesota and southern Ontario; adventive in New York; coastal populations to New England

**Description:** Plants with bisexual flowers; stigmas 1 per carpel, small, obconical, each borne at the tip of a short style; ovaries numerous (9–39), unicarpellate, free, obconical, each borne in a pit in the receptacle and basally attached; ovule 1 per ovary, anatropous, pendulous, becoming a seed which fills the indehiscent fruit; embryo completely filling the pericarp, but surrounded by a thin membranous sheath; endosperm lacking; perisperm lacking; cotyledons consisting of two lobes, developing from a ring at the base of the plumule (suggesting a single, fused structure); plumule leaves peltate, grading only in size into mature leaves; fruit in an aggregate of indehiscent nutlets, 0.8–1.5 cm long, borne in pits in a woody receptacle; receptacle obconic, with a flat, truncated summit, 6–12 cm in diameter, erect to reflexed-pendulous at maturity; pits in the receptacle expanding to release...
many of the fruit by late fall; stamens numerous (±200), spirally attached, fairly well differentiated into slender filaments and elongate, antrorse anther sacs, each tipped with a slender, hooked appendage; perianth radially symmetrical up to 25 cm in diameter, poorly differentiated into calyx and corolla; petals 20 or more, 4–12 cm long, 2–6 cm broad, lanceolate to linear with rounded to obtuse tips, yellow and early deciduous (2–3 days); calyx of 2–5 lobes, green to yellowish, more persistent than petals but otherwise similar; flowers borne singly on long peduncles; bracts absent; peduncles glabrous, tough, erect, holding the flower above the water surface, often reflected at the tip in fruit, arising from the nodes of underwater rhizomes; leaves orbicular, centrally peltate, glabrous, leathery, waxy, shading water readily, 20–50 (70) cm broad, floating or elevated on the stiff petioles up to 1 m above the water surface; petals arising from the nodes of the rhizomes which lie buried horizontally in mud; rhizome 1–2 cm thick, producing large, starchy tubers in the fall. (2n = 16).

Importance: American Indians utilized the tubers as a source of starchy food. The leaf stalks and young leaves were cooked as a vegetable. Seeds, eaten before the seed coat hardens, have a chestnut-like flavor. At later stages, the embryo of the ripe seeds may be removed from the hard fruit coat, cooked and ground for breadstuff. The seeds show remarkable powers of longevity and dormancy, and may be stored indefinitely. The woody fruiting receptacles are often sold for use in dried arrangements, and are unusual and attractive. These "pods" have been used by native American shamans as rattles in ritual healing practices. *Nelumbo* species (both yellow and pink flowered) are often cultivated in ponds, especially farther south.

### Cabombaceae (Water-Shield Family)

A family of two genera of strictly aquatic plants, variously treated in the past: 1) as an integral part of the Nymphaeaceae, 2) a distinct subfamily, Cabomboidae, within Nymphaeaceae, or 3) as a distinct family, with perhaps closer relationships to the Ceratophyllaceae or Ranunculaceae. *Brasenia* is monotypic and cosmopolitan, except for Europe; *Cabomba*, with about six species in warmer parts of the world, has only one species which reaches our area.

#### FAMILY DESCRIPTION

Plants have small, bisexual flowers which are radially symmetrical and axillary on an elongate, cauline axis which arises from a submerged rhizome. The gynoecium is multi-carpellate, consisting of 3–18 free ovaries. The stamens are hypogynous, (3) 6–36, anther sacs dorsal or ventral. The perianth is biseriate, consisting of 3 (rarely 4) petals and 3 (4) sepals. The fruit is an indehiscent pod, containing (1) 2–3 pendulous seeds, each with a small amount of endosperm and copious perisperm. Both genera produce spirally arranged, floating, peltate leaves, but *Cabomba* is dimorphic, producing primarily capillary-dissected, submerged leaves, with the tiny, floating, peltate leaves only near the branch tips subtending the flowers. Both genera produce a milky latex and secrete a mucilaginous covering, but this is much more pronounced in *Brasenia*.

#### KEY TO GENERA

1. Leaves mostly submerged, capillary-dissected, fan-shaped with few, small, peltate, floating leaves; stamens 3–6 in creamy-white flowers

1. Leaves uniformly peltate, elliptic, almost all floating; stamens 12–36, in dull, purplish flowers

2. *Brasenia* (p. 33)

1. **Cabomba** (p. 31)

#### 1. CABOMBA

**Common Names:** Fanwort, Carolina Water-shield, Fish-grass, Washington-plant, Cabomba

**Authority:** Aublet, Pl. Gui. I. 321. t. 124, 1775

A genus of almost wholly submerged aquatics, with about 6 species in the warmer parts of the Western Hemisphere. One species occurs in New York State as an escape after the dumping of aquaria.
1. *Cabomba caroliniana* Gray

Common Names: Fanwort, Carolina Water-shield

Type Description: Gray, Ann. Lyc. N.Y., vol. 4, p. 47, 1837


Origin: Eastern North America

Habitats: Ponds, lakes, sloughs, swamps and quiet streams

Habit: Attached, submerged aquatic, with a few floating leaves and emergent flowers

Flowering: May–September

Fruiting: July–November

General Distribution: Florida to Texas, north to Maryland and Virginia (escaping northward to New England)

Description: Plants with bisexual flowers; stigmas 1 per carpel, small, each terminating in a short style; ovaries 3 (2–4) per flower, each of a single carpel, free, each carpel becoming an indehiscent pod in fruit; ovules 1–3 per carpel, attached to the dorsal suture, becoming pendulous seeds and finally enclosed tightly by the pod; endosperm and copious perisperm present; stamens (3) 6, hypogenous, the short anther sacs extrorse; perianth radially symmetrical, 0.9–1.5 cm in length with separate petals and sepals in two whorls of 3 (rarely 4); petals white to cream, short-clawed, one with two yellow-spotted, auriculate lobes at the base; sepals creamy-greenish to rose-tinged, unlobed; flowers borne singly, emergent, on slender peduncles from the axils of small, floating leaves, floating leaves few, alternate, peltate, linear-elliptic, 1.1–2.1 cm in length, entire to irregular or constricted near the petiole connection, often bifid at one end, also slightly pubescent beneath with a slight mucilaginous coating, petioled, submersed leaves opposite or whorled, capillary, fan-shaped, palmately dissected into linear-filiform, often dichotomously branching segments, up to 6 cm broad, subsessile or on petioles to 2 cm in length; stipules absent; nodes and internodes delicate, but tough, not fragmenting easily; stems (as well as leaves) often reddish, plants becoming up to 2.5 m long from a congested, fibrous root system in the substrate. (2n = 24).

Importance: Plants are eaten by waterfowl and rough fish, and provide excellent cover for minnows. They are used as substrate by microflora and browsing microfauna, and dense bed of the plants tend to be rich in associated plankton. In southern regions the plants may become a nuisance to small boat traffic. They speed the eutrophication process in shallow lakes. This species is used as a decorative ornamental in aquaria and frequently escapes.
2. BRASENIA

Common Name: Water-shield
Authority: Schreber, Gen. Pl. vol. 1, p. 372, 1789

A monotypic genus of strictly aquatic, herbaceous plants with almost cosmopolitan distribution.

1. Brasenia schreberi Gmel.

Common Names: Water-shield, Purple Wendock, Dollar-bonnet

Type Description: Gmelin, Syst. Veg. I, p. 853, 1796

Synonyms: Menyanthes nymphoides Thunb., Hydropeltis purpurea Michx., Brasenia peltata Pursh, Brasenia purpurea (Michx.) Casp.

Origin: Ancient and uncertain

Habitats: Lakes, ponds, ditches and other still waters

Habit: Floating-leaved aquatic; stems usually attached

Flowering: June–September (October)

Fruiting: July–November

General Distribution: Erratic-cosmopolitan (absent in Europe)

Description: Plants with bisexual flowers; stigmas 1 per carpel, linear, each borne laterally on a fleshy style; ovaries 4–10 (18), free, each of a single carpel, becoming a clavate, coriaceous, indehiscent pod in fruit; ovules 2 (1–3) per carpel, pendulous from the dorsal suture, becoming orbicular seeds, 2–3 mm long, with endosperm and copious perisperm; stamens hypogynous, 12–20 (36), with slightly introrse anther sacs, purplish-red; perianth radially symmetrical, in two whorls, 1–1.8 cm broad; petals 3 (4), dull red-purple, ovate-lanceolate, 0.6–1.5 cm long; sepals similar to the petals; flowers solitary on axillary peduncles; leaves alternate, centrally peltate, broadly oval to suborbicular, entire, shiny green to reddish above, red-purple and coated with mucilage below at maturity, 4–9 cm long; peduncles slender, purplish, also coated with the mucilaginous substance, as are the stems; stems are much-branched and attached (though they may break free and survive) to a slender, creeping rootstock. (2n = 80).

Importance: The tuberous roots are reportedly eaten as food by Indians in the western United States, and the young leaves and petioles (prior to extensive mucilage formation) are eaten by the Japanese in salads.
Ceratophyllaceae (Hornwort Family)

Members of this group are highly specialized vegetatively to live as submerged aquatics. Their flower structure, however, is relatively primitive, placing the family in Nymphaeales. The position and relationships of the family remain in doubt. The single genus, Ceratophyllum, has five species, two of which occur in New York State. They are of ecological importance to fish and waterfowl, and are sometimes grown as aquarium plants.

FAMILY DESCRIPTION

Perennial, submerged aquatics, forming floating mats of stolons and rhizomes, not rooted. Leaves are whorled on the stems and are coarsely to finely dichotomously dissected, with very short petioles (or sessile) and no stipules. Blades are of linear to filiform branching segments with serrulate to ciliate margins, or entire. Vegetation feels rough to the touch by comparison with most other submerged angiosperms. Plants are monoecious. Flowers are minute, regularly symmetrical, borne singly at the nodes. The perianth (sometimes called involucre) is of a single series, the 10–16 lobes fused at the base into a shallow cup. Stamens are erect with short, fleshy filaments, each with a broad connective which projects beyond the 2 anther sacs into 2 (3) lobes. Stamens 8–22, crowded, about equaling the perianth lobes of the male flowers, deciduous prior to anthesis. Carpels are 1 per female flower, exerted, with a long, persistent style, 1-locular with a single, laminar, pendulous ovule. The fruit is a single-seeded, nut-like achene with horn-like spines. The embryo is large, and endosperm is absent.

1. CERATOPHYLLUM

Common Names: Hornwort, Coontail, Cornifle

Authority: Linnaeus, Species Pl., p. 992, 1753

A circumboreal genus of submerged aquatic plants. Two species are found in New York State in lakes, streams and backwaters.

KEY TO SPECIES OF CERATOPHYLLUM

1. Terminal leaf branches often free of teeth, capillary; fruit warty, with more than 2 (4–15) lateral and basal spines, their bases confluent along a narrow ridge.................................1. Ceratophyllum echinatum (p. 35)

1. Terminal leaf branches mostly toothed, linear to subcapillary; rarely fruiting; fruit smooth to slightly warty, basal spines 2 only..............................................................2. Ceratophyllum demersum (p. 36)
1. *Ceratophyllum echinatum* Gray

Common Names: Hornwort, Coontail, Hornweed

Type Description: Gray, Ann. N.Y. Lyc. vol. 4, 1837

Synonym: *C. demersum* L. var. *echinatum* Gray

Origin: Eastern North America

Habitats: A variety of aquatic habitats in still or slow-moving waters, and often deep

Habit: Submerged aquatic, much-branched and rootless

Flowering: July–August

Fruiting: July–September

General Distribution: Maine and southwestern Quebec to Minnesota, south to Florida, Texas and Mexico

Description: Plants monoecious; stigma 1, style 1, filiform, equaling the ovary in length, persistent and spine-like in fruit; ovary 1 per female flower, becoming warty, oblong achene 3–4 mm long, with 4–10 (15) hooked, basal and lateral spines; ovule pendulous, becoming a single seed with a large embryo and no endosperm; perianth ("involucre") of 10–16 lobes which are strap-like, serrulate and ciliate near the tips, ca. 0.5 mm long, elongating somewhat and persistent at the fruit base; male flowers with 10–20 deciduous stamens; anther sacs 2; filaments fleshy, prolonged above the anther sacs into 2 (3) hood-like floats; peduncles very short; flowers minute, solitary, axillary; leaves whorled, 3–8 per node, 1.8–2.7 cm long, dichotomously or trichotomously dissected (usually 2–3 times per leaf), the basal segments often flattened, linear, with capillary to subcapillary terminal segments, margins entire or minutely serrulate-ciliate; stipules absent; nodes slightly swollen; internodes very short near branch tips, to 6 cm when fully elongated, stems lax, submerged, with numerous lateral branches; seedling with two, large, linear, cotyledons, cleft leaves and no radicle; roots totally absent.

Infraspecific Variation: Vegetatively the plants vary in the presence or absence of tiny spines on leaf segments, and in the relative capillarity of terminal segments. Fruit spines also vary in number.

Importance: The achenes and sometimes vegetative parts are eaten by waterfowl.
2. *Ceratophyllum demersum* L.

**Common Names:** Coontail, Hornwort, Hornweed, Cornille (Quebec)

**Type Description:** Linnaeus, Species Pl., p. 992, 1753

**Synonym:** *C. muricatum* Cham.

**Origin:** Uncertain

**Habitats:** Lakes, ponds, slow-moving streams and river backwaters, often in relatively shallow water

**Habit:** Submerged aquatic, much branched, rootless, forming coarse, dense mats

**Flowering:** (June) July–August

**Fruiting:** July–October

**General Distribution:** Circumboreal, found widely throughout North America

**Description:** Plants monoecious; stigma 1, style 1, filiform, equaling the ovary in length, persistent and spine-like in fruit; ovary 1 per (female) flower, becoming a smooth to slightly warty oblong achene, 3–4 mm long with 2 stiff basal spines; ovule pendulous, becoming a single seed with large embryo and no endosperm; perianth (“involucre”) of 10–15 lobes which are strap-like, with dentate tips, slightly fused at the base, ca. 0.5 mm, elongating somewhat and persistent in fruit; **male flowers** with 8–20 deciduous **stamens**; **filaments** fleshy, prolonged above the 2 anther sacs into 2 (3) corona-like **floats**; **peduncles** very short; flowers minute, solitary, axillary; leaves whorled 3–8 (10) per node, 0.9–2.5 cm long, dichotomously (trichotomously) branched and dissected, the segments linear, usually flattened, with minute to substantial teeth along one side (rarely on both sides or absent from some leaves); stipules absent; leaves virtually sessile; **nodes** slightly swollen; **internodes** 3 mm to 5 cm long, gradually increasing away from the apex; stems lax to springy in texture (rough to the touch), very dense, small lateral buds (hibernacula) become dormant and starch-rich, falling to the bottom and overwintering; **seedlings** have two, large, linear, cotyledons and unbranched first leaves with no radicle or other sign of roots.

**Infraspecific Variation:** Leaves vary in length, shape and marginal teeth, often on the same individual.

**Importance:** *Ceratophyllum* is one of the major food sources of waterfowl, which not only eat the fruit and foliage, but seek out the starchy, dormant buds in the fall. The plants may also provide breeding grounds and hiding places for small fish. They are important ecologically in crowding out other plant species, changing light conditions where they form dense mats and serving as a substrate for microscopic animals and plants. They are frequently found in close association with green algae, and serve with them to oxygenate the aquatic habitats in which they occur.
APPENDIX I

FUNGI ASSOCIATED WITH PLANT SPECIES IN THIS TREATMENT

To be included on this list, a fungus must occur on a species in this treatment somewhere in the United States. If a fungus occurs in New York State and has not as yet been recorded on a host covered in this treatment, but has been collected on such a host in some other state, it is marked with a single asterisk (*).

Abbreviations of states indicate a literature citation for each. Double asterisks (**) indicate that a herbarium specimen with New York State host information has been seen.

CHYTRIDIALES

Physoderma sp., Leaf Gall on Saururus cernuus (Va.)
Synchytrium asari Arth. & Holw., on leaves and petioles of Asarum canadense (Minn., Wisc.)

PERONOSPORALES

Pythium marsipium Drechs., Leaf and stem rot of Nymphaea odorata (Mass., N. Y., Wisc.)
Pythium proliferum deBary, Leaf and stem rot of Nymphaea odorata (Mass., N. Y., Wisc.)
Pythium undulatum Peterson, Leaf and stem rot of Nymphaea odorata (Mass., N. Y., Wisc.)
Pythium sp., on Nymphaea odorata (Wisc.)

MUCORALES

Endogone fasciculata Thaxt., mycorrhizal with Liriodendron tulipifera
Endogone gigantea Nicolson & Gerdemann, mycorrhizal with Liriodendron tulipifera (Ind., S. Dak.)

ENTOMOPHTHORALES

Acaulopage dichotoma Drechs., in decaying leaves of Nymphaea odorata capturing and consuming amoebae (Wisc.)

ERYSIPHALES

Erysiphe polygoni DC., *Powdery mildew on Liriodendron tulipifera (widespread)
Microsphaera alni DC. ex Wint., Powdery mildew on Magnolia acuminata
Phyllactinia corylea Pers. ex P. Karst. Powdery mildew on Liriodendron tulipifera (N. Y. to Ala. and Mo.), on Magnolia acuminata (Ohio, Pa.), and on Sassafras albidum (Mich.)

MELIOLALES

Irene aralies Spreng. ex Syd., Black mildew on Magnolia virginiana (Miss.)
Irene perseae (F. L. Stev.) Toro, Black mildew on Persea borbonia (Ala., Fla., Miss.)
Meliola amphitricha Fr., Black mildew on Persea borbonia (Fla., Mich.)
Meliola magnoliae F. L. Stev., on Magnolia virginiana (Ga.)

HYPOCREALES

Hypocrea minima Sacc. & Ellis, on Magnolia bark (N.J.)
Hypocrea olivacea Cook & Ellis (H. melaleuca Ellis & Everh.), bark of Sassafras albidum (N. J.) known only from the type locality
Hyponectria magnoliae (Schw.) Barr, on dead leaves of Magnolia virginiana (N. J.)
Nectria aureo-fulva Cooke & Ellis, on Magnolia sp. (N. J.)
Nectria cinnabarina (Tode ex Fr.) Fr., * on twigs of Asimina triloba (W. Va.), on twigs of Calycanthus floridus (Md.)
Nectria coccinea (Pers. ex Fr.) Fr., * on bark of various trees including Magnolia (Vt. to W. Va., N. Dak.)
Nectria magnoliae Lohman & Hepting, on bark and branches of Liriodendron tulipifera (Conn. to N. C., Ohio, Tenn., W. Va.)
Nectria ochroleuca (Schw.) Berk. (= N. conigena Ellis & Everh.), on bark of various trees including Liriodendron tulipifera, Lindera benzoin, and Magnolia spp. (N. Y., Ohio to Mo. and La.)

Nectria pallidata Cooke (= Cucurbitaria pallidula (Cooke) O. Kuntze), on Lindera benzoin (Pa., Tenn.)

Nectria verrucosa Sacc., on Sassafras albiculata (Ala., Conn., Del., N. J., N. Dak., Pa., S. C.)

Nectria sp., canker on Liriodendron tulipifera (W. Va. to N. C. and Tenn.)

Nectria sp., canker on Magnolia acuminata (W. Va.)

Nectria sp., (? N. galligena Bres.) Branch and trunk canker of Sassafras albiculata (Conn. to W. Va.)

SPHAERIALES

Acanthostigma berenice (Berk. & Curtis) Sacc., on Magnolia virginiana (Fla.)

Anisogramma sp. (= Apioporella corni Wehm., illegitimate name), on dead twigs on Sassafras albiculata (Pa.)

Anthostomella sp., on Liriodendron tulipifera (Ga.)

Calospora sp., * on Liriodendron tulipifera (Ga.)

Camarops polyspernum (Mont.) Mill., on Liriodendron tulipifera (Ga.)

Camarops pugillus (Schw.) Shear, on Liriodendron tulipifera (Va.)

Ceratostomella multiannulata Hedge. & Davidson, Blue wood stain of Liriodendron tulipifera (Va. to Gulf States)

Ceratostomella plurianulata Hedge., Blue wood stain of Liriodendron tulipifera (Va. to Gulf States)

Crypocolus sassafras (Ellis & Everh.) Berl. (= Diatrypella sassafras Ellis & Everh.), on branches of Sassafras albiculata (N. J.)

Cucurbitaria congesta Cooke & Ellis, on Magnolia (N. J.)

Daldinia concentrica (Bolt. ex Fr.) Ces. & DeNot. [= D. vernicosa (Schw.) Ces.], Wood rot of Liriodendron tulipifera and Sassafras albiculata (Ga., Va.)

Diaporthe biglobosa (Cooke & Ellis) Sacc. (= Sphaeria biglobosa Cooke & Ellis), on branches of Sassafras albiculata (N. J.)

Diaporthe binoculata (Ellis) Sacc. (= Valsa binoculata Ellis), on dead branches on Magnolia virginiana (N.C., N. J., N. Y. **)

Diaporthe eres Nits. * (= D. magnoliæ Ellis & Everh.), on dead branches of Liriodendron tulipifera (Md.), on dead branches of Magnolia acuminata (Ga.)

Diaporthe pardalota (Mont.) Fückel (= D. sassafras Dearn. & House), on Sassafras albiculata (N. Y. **)

Diaporthe sociata (Cooke & Ellis) Sacc. (= Valsa sociata Cooke & Ellis), on Lindera benzoin (Mass., Md., N. Y. **, W. Va.)

Endoconidiophora virescens Davidson (Ceratocystis sp. ?), Sapstreak, Blue wood stain of Liriodendron tulipifera and Magnolia (Va. to Gulf States)

Eriospheria alligata (Fr.) Sacc., on decaying Sassafras albiculata trunk (N. Y. **)

Eutypella glandulosa Cooke, on Sassafras albiculata (N.Y.)

Eutypella linderae (Peck) Berlese (= Valsa linderae Peck), on dead branches of Lindera benzoin (Ind., N. J., N. Y. **, Ohio)

Fenestella sp., on Magnolia virginiana (N. J.)

Glomerella cingulata (Ston.) Spauld. & Schenk (= Gloeosporium fructigenum Berk.), on twigs and fruits of Lindera benzoin (N. J.), on Sassafras albiculata (Tex.)

Griphosphaeria corticola (Fückel) Höhm., on branches of Sassafras albiculata (N. J.)

Hypoxylon hypophlaeum (Berk. & Rav.) J. H. Miller, on Liriodendron tulipifera and Magnolia virginiana (Ga.)

Hypoxylon microplacum (Berk. & Curtis) J. H. Miller [= Diatrype microplaca Berk. & Curtis, Nummularia microplaca (Berk. & Curtis) Cooke, Nummularia gracilenta Sydow, and Nummularia scutata Berk. & Cooke], on dead wood of Magnolia virginiana (Ga., N. C.), and on dead branches of Sassafras albiculata (N. Y. **, Md. to Ala. and Ga., Ind.)

Hypoxylon occidentale Ellis & Everh. ex P. Martin, on Liriodendron tulipifera (Ohio)

Hypoxylon sassafras (Schw. ex Fr.) Berk., on Lindera benzoin (N. Y. **, Md.), on Liriodendron tulipifera (N. Y. **), and on Sassafras albiculata (N.Y. ** to Ga. and Mo.)

Hypoxylon sp., on Persea borbonia (Ga.)

Hypoxylon sp., Wood rot of Liriodendron tulipifera (Ga.)

Lasiosphaeria ovina (Pers. ex Fr.) Ces. & DeNot., * on Liriodendron tulipifera (Ga.)

Lasiosphaeria pezicola (Berk. & Curtis) Sacc., Wood stain in Liriodendron tulipifera (S. C.)
Lasiosphaeria strigosa (Alb. & Schw. ex Fr.) Sacc., on Liriodendron tulipifera (Ga.)
Metasphaeria sassafrasica Tethon & Stout, on leaves of Sassafras albidum (Ill.)
Nummularia discincola (Schw.) Cooke, on Magnolia (Eastern U.S. and Canada)
Phyllachora perseae Hodges, on Persea borbonia (S. C.)
Plagiostoma magnoliae (Ellis) Barr (= Gnomonia magnoliae Ellis), on fallen leaves of Magnolia virginiana (Md., N. J., Ga.)
Pleuroceras sassafras (Ellis & Everh.) Barr (= Gnomonia sassafras Ellis & Everh.), on leaves of Sassafras albidum
(Pers. ex Fr.) Rh., on Magnolia virginiana (Md., N. J., Ohio)
Pseudomassaria carolinensis Barr & Hodges, on Persea borbonia (S. C.)
Valsaambiens (Pers. ex Fr.) Fr., * on dead twigs of Asimina triloba (Va., W. Va.), on branches of Magnolia acuminata (N. Y. **)
Valsaria nigrofacta (Cooke & Ellis) Sacc. (Valsa nigrofacta Cooke & Ellis), on Sassafras albidum (N. J.)

PHACIDIALES

Lophodermium punctiforme (Fr.) Fuckel, on Liriodendron tulipifera (Ga.)
Rhytisma liriodendri Wallr., Black leaf spot on Liriodendron tulipifera (Calif., Tex.)

HELOTIALES

Angelina rufescens (Schw. ex Fr.) Duby, * on Liriodendron tulipifera (Ga.)
Chlorociboria aeruginosum (Pers. per Fr.) Seaver ex Ram., Korf, & Bat, Green wood stain on rotting Liriodendron tulipifera wood (Northern hemisphere, N. Y. **)
Patellariopsis clavispora (Berk. & Br.) Dennis (= Patellaria ?), on scale insects on Liriodendron tulipifera (Ga.)
Fizzoella oenotherae (Cooke & Ellis) Sacc. [= Sclerotipis concava (Desm.) Shear & Dodge], on Liriodendron tulipifera (Ga.), on branches of Magnolia acuminata (N. C.)
Sclerotinia gracilipes (Cooke) Sacc., on flower parts, Petal rot of Magnolia virginiana (Md., N. J.)
Whetzelina sclerotiorum (Lib.) Korf & Dumont, Rhizome rot of Asarum canadense (N. Y.)

MYRIANGIALES

Myriangium duriae Mont. & Berk., on Magnolia virginiana

PLEOSPORIALES

Botryosphaeria calycanthi (Schw.) Sacc., on twigs of Calycanthus floridus (N. C., Va.)
Botryosphaeria ribis Gross. & Dug., * on branches of Liriodendron tulipifera (Fla., Ga., Pa.)
Botryosphaeria ribis var. achromogena Gross. & Dug., Canker on Lindera benzoin (Md.), on branches of Liriodendron tulipifera (Fla., Ga., Pa.)
Didymosphaeria magnoliae J. H. Miller & G. E. Thompson, on dead leaves on Magnolia virginiana (Ga.)
Guignardia magnoliae (Schw.) J. H. Miller [= Sphaeria magnoliae Schw., Sphaerella magnoliae Ellis, Sphaerella annulata Cooke, Laestadia magnoliae Sacc., and Mycosphaerella annulata (Cooke) Miles of USDA Index of Plant Diseases], on Magnolia virginiana (Fla., Ga., Miss., N. J., N. C., S. C.)
Microdochella ramularis (Ellis & Everh.) Tassi, on twigs of Lindera benzoin (Pa.)
Physalospora fusca N. E. Stevens, on branches of Sassafras albidum (Ala.)
Physalospora obtusa (Schw.) Cooke (= Botryosphaeria ?, Sphaeropsis seriata Peck, S. punctata Dearn. & House, S. linderae Peck ?, S. malorum Peck non Berk.), on Aristolochia, on branches of Calycanthus floridus (Ga., N. Y., Va.), on branches of Lindera benzoin, on branches of Liriodendron tulipifera (Md. to Ga. and Tenn.), on branches of Magnolia, and on branches of Sassafras albidum (N. Y. to Ga. and Miss.)
Physalospora rhodina (Berk. & Curtis) Cooke, * on branches of Sassafras albidum (Ala.)

HYSTRIALES

Hysterium pulicare Fr., on Liriodendron tulipifera, and on Sassafras albidum (N. Y. **)
Karschia stygia (Berk. & Curtis) Massee [=? Buellia stygia (Berk. & Curtis) E. Müller], on Liriodendron tulipifera (Mass. to Ga., Mich., Ind., Ohio, Iowa)
Lecanidion atratum (Hedw. ex Fr.) Endlich., * on scale insects on Liriodendron tulipifera (Ga.)
Ostreion americanum Duby (= Lophium sassafras Schw.), on Sassafras albidum
DOTHIDEALES

Coccoidella scutula (Berk. & Curtis) Höhn., on living leaves of Persea borbonia and Magnolia sp. (N. C. to Fla., Miss. and Tex.)
Didymosphaeria linderae Sacc., on Lindera benzoin (N.Y. **)
Dothisidea linderae Gerard, on branches of Lindera benzoin (N.Y. **, Pa.)
Mycosphaerella exutans (Cooke) Barr, on living leaves of Persea borbonia (Tex.)
Mycosphaerella glauca (Cooke) Barr, on Magnolia virginiana (Fla., N. J., S. C.)
Mycosphaerella infuscans (Ellis & Everh.) Barr, on overwintered petioles of Liriodendron tulipifera (W. Va.)
Mycosphaerella liriodendri (Cooke) Woron., Leaf spot on Liriodendron tulipifera (Ga., Mich., N. Y.)
Mycosphaerella milleri Hodges & Haasis, perfect state of Cercospora magnoliae
Mycosphaerella pontederiae (Peck) House, Leaf spot on Nuphar luteum (Ma., Mich., N. Y. **, Va., Wisc.), on Nuphar x rubrodiscum (N. Y. **), Leaf spot on Nymphaea odorata (Va.)
Mycosphaerella sassafras (Ellis & Everh.) Bubak & Kab., on leaves of Sassafras albidum (N. Y. to Ga. and Kans.)
Mycosphaerella tulipiferae (Schw.) Higgins (= Depaeza tulipiferae Schw., and Phyllosticta liriodendri Cooke), on Liriodendron tulipifera (mid-Atlantic to Gulf States)
Mycosphaerella sp. (Sphaerella asiminae Ellis & Kellerm.), Leaf spot associated with Phyllosticta asiminae Ellis & Kellerm., on Asimina triloba (Ind., Ohio, W. Va.)
Mycosphaerella sp., on Magnolia virginiana (Ga.)
Scirrhia concaviuscula (Ellis & Everh.) Barr [= Dothisidea concaviuscula Ellis & Everh., Dothidella concaviuscula (Ellis & Everh.) Theiss. & Syd.], on dead branches of Magnolia virginiana (N. J.)
Trichodothis comata (Berk & Rav.) Theiss. & H. Sydow (Asterina comata Berk.), on Magnolia virginiana (Ala., Tex., Miss.)

CAPNODIALES

Capnodium elongatum Berk. & Desm., Sooty mold on Liriodendron tulipifera (cosmopolitan)
Englerula carnea (Ellis & G. Martin) Höhn. (= Asterina carnea Ellis & G. Martin), Black leaf spot on Persea borbonia (Fla.)

MICROTHYRIALES

Asterina ramularis Ellis, on Lindera benzoin (Pa.)
Asterina sp., on leaves of Persea borbonia (southern states)
Chaetothyris sp. (= Venturia applanata Ellis & G. Martin), on leaves of Magnolia virginiana (Fla.)
Lembosia rugispora Tracy & Earle, Black mildew on Persea borbonia (Miss., N. C.)
Micropeltis abalaminensis Earle, Black leaf spot on Magnolia virginiana (Ala.)
Stigmatophragmia sassafrasica Tehon & Stout, on leaves of Sassafras albidum (Ill.)

USTILAGINALES


TREMELLALES

Aporpium caryae (Schw.) Teixeira & Rogers, * on Liriodendron tulipifera

SEPTOBASIDIALES

Septobasidium langloisii Pat., on scale insects infesting bark of Magnolia virginiana (Gulf States)
Septobasidium tenue Couch, on scale insects infesting bark of Magnolia virginiana (Gulf States)

CORTICIACEAE

Laeticorticium sulphurellum (Peck) Gilbertson (= Hydnum sulphurellum Peck), * on Liriodendron tulipifera (N.C.)
Merulius interruptus Bres., White rot in Liriodendron tulipifera (Va.)
Phlebia chrysocrea (Berk. & Curtis in Berk.) Burds. in Lombard et al. (= Cortici um lividum Pers. ex Fr.), * on Liriodendron tulipifera (S. C.), on Sassafras albidum (Ga.)
Phlebia radiata Fr., * on Liriodendron tulipifera and Magnolia virginiana (widespread)
Serpula atrovirens (Burt) Cooke (= Merulius atrovirens Burt), on Liriodendron tulipifera (N. C.)

STEREACEAE
Haematostereum gausapatum (Fr.) Pouz. (= Stereum gausapatum Fr.), * Wood rot of Liriodendron tulipifera logs
Stereum umbrinum Berk. & Curtis, Wood rot of Liriodendron tulipifera logs
Tomentella brunneorufa M. J. Larsen, on Liriodendron tulipifera (Md.)

SCHIZOPHYLLACEAE
Schizophyllum commune Fr., * Sapwood rot on Liriodendron tulipifera, Magnolia virginiana, and Sassafras albidum (cosmopolitan)
Solenia anomala (Pers. ex Fr.) Fuckel (= Henningsomyces ?), * on Lindera benzoin (Tenn.)

HYDNACEAE
Hericium erinaceus (Bull. ex Fr.) Pers. (= Hydnum erinaceus Bull. ex Fr., H. caputmedusae Bull. ex Fr.), * Wood rot on Liriodendron tulipifera (Va.)
Radulum magnoliae Berk. & Curtis, on Magnolia virginiana (S. C.)

HYMENOCHAETACEAE
Coltricia mowryana Murrill, on Persea borbonia (Fla.)
Hymenochaete corrugata (Fr.) Lev. (= H. agglutinana Ellis), * Wood rot of Lindera benzoin (Conn., Pa.), and Sassafras albidum (Va.)
Hymenochaete tabacina (Sow. ex Fr.) Lev., * on dead branches of an Aristolochia sp. (Calif.)

POLYPORACEAE
Coriolus hirsutus (Wulfen ex Fr.) Quel. (= Polyporus hirsutus Wulfen ex Fr.), * Wood rot in Liriodendron tulipifera, Magnolia spp., Persea borbonia (Fla.), and Sassafras albidum (Ind., N.C.)
Coriolus pubescens (Schum. ex Fr.) Quel. (= Polyporus pubescens Schum. ex Fr.), * Wood rot in Liriodendron tulipifera and Sassafras albidum
Coriolus versicolor (L. ex Fr.) Quel. (= Polyporus versicolor L. ex Fr.), * Wood rot of Liriodendron tulipifera, Magnolia spp., and Sassafras albidum (Ind., Md., N. C., Va.)
Daedalea confragosa Bolt. ex Fr., Trunk rot of Sassafras albidum (Ind., N. Y.)
Daedalea extensa Peck, * Wood rot of Liriodendron tulipifera
Daedalea unicolor Bull. ex Fr., * Wood rot of Liriodendron tulipifera, and Magnolia spp. (widely distributed)
Fomes geotropus Cooke, on Magnolia sp. and Persea borbonia (Fla.)
Fomes supinus Schw. ex Cooke, on Persea borbonia (Fla.)
Gloeophyllum sepiarium (Wulfen ex Fr.) Karst. [= Lenzites sepiaria (Wulfen ex Fr.) Fr.], * Wood rot of logs and timber of Liriodendron tulipifera (cosmopolitan)
Gloeophyllum trabea (Pers. ex Fr.) Murrill (= Lenzites trabea Pers. ex Fr.), * Decay of Liriodendron tulipifera lumber
Irpex lacteus (Fr. ex Fr.) Fr. [= Polyporus tulipiferae (Schw.) Overh.], Wood rot in Liriodendron tulipifera (N. Y.
** generally distributed
Ischnoderma resinosa (Schrad. ex Fr.) Karst. [= Polyporus resinosus Schrad. ex Fr., P. benzoinus (Wahl.) Fr.], * Wood rot in Lindera benzoin and Liriodendron tulipifera (northern U. S.)
Lenzites betulina (L. ex Fr.) Fr., * Wood rot of logs and timber of Liriodendron tulipifera (cosmopolitan)
Phellinus everhartii (Ellis & Gall.) Pilat (= Mucronoporus everhartii Ellis & Gall.), on Liriodendron tulipifera (eastern U. S.)
Phellinus gilvus (Schw. ex Fr.) Pat. [= Polyporus gilvus Schw. ex Fr.) F.r.], * Wood rot of Sassafras albidum (Ind., La., Md.)
Phellinus igniarius (L. ex Fr.) Quel. [= Fomes igniarius (L. ex Fr.) Kicks.], * White heart rot of Sassafras albidum (Ohio, Va.)
Phellinus ribis (Schum. ex Fr.) Quel. [= Fomes ribis (Schum. ex Fr.) Gill.], * Red heart rot of Sassafras albidum (Md.)
Polyergus adustus Wildl. ex Fr., * Wood rot of Liriodendron tulipifera
Polyergus amplectens (Murrill) Sacc. & Trott., on Asimina (Ga.)
Polyergus caesius Schrad. ex Fr., * Wood rot of Liriodendron tulipifera and Magnolia spp.
Polyergus dichrous Fr., * Wood rot in Liriodendron tulipifera
Polyergus graveolens (Schw.) Fr., Wood rot in Liriodendron tulipifera
Polyergus mutabilis Berk. & Curtis, on Persea borbonia (Fla.)
Polyergus sulphureus Bull. ex Fr., * Wood rot in Liriodendron tulipifera and on Persea borbonia (Fla.)
Polyergus zonalis Berk., Wood rot of Liriodendron tulipifera (Southern States)
Poria canescens P. Karst., on Liriodendron tulipifera (Great Lakes region)
Poria cinerea (Schw.) Cooke, on Liriodendron tulipifera (Pa.)
Poria eupora (Karst.) Cooke, * on Liriodendron tulipifera (Va.)
Poria ferruginosa (Schrad. ex Fr.) Fr., * Wood rot of Sassafras albidum
Poria incassata (Berk. & Curtis) Burt, on decaying Liriodendron tulipifera and Sassafras albidum lumber (widely distributed)
Poria isabelina (Fr.) Overh., Sapwood rot of Asimina trifolia (Va., W. Va.)
Poria medulla-panis (Jacq.) Bres., * ? on Sassafras albidum (widely distributed)
Poria punctata (Fr.) Cooke, * on Asimina trifolia (Va.)
Poria sassafras (Schw.) Cooke, on decaying Sassafras albidum wood (Pa.)
Pycnoporus cinnabarinus (Jacq. ex Fr.) Karst. (= Polyergus cinnabarinus Jacq. ex Fr.), * Wood rot of Liriodendron tulipifera (W. Va.)
Trametes albida (Fr. ex Fr.) Bourdot & Galzin (= Trametes sepium Berk.), * Wood rot of Sassafras albidum (Ind.)
Trametes malicola Berk. & Curtis, * Wood rot of Lindera benzoin

AGARICALES

Armillariella mellea (Vahl. ex Fr.) Karst., * Root rot of Liriodendron tulipifera (Va.), Root rot of Sassafras albidum (Pa.)
Flammulina velutipes (Fr.) Karst. [= Collybia velutipes (Fr.) Kummer], White, spongy trunk rot of Liriodendron tulipifera (W. Va.)
Hypholoma sp., * Butt rot of Liriodendron tulipifera (W. Va.)
Pleurotus ostreatus (Jacq. ex Fr.) Kummer, * Sapwood rot of Liriodendron tulipifera (infection occasional)
Strobilurus conigenoides (Ellis) Sing. (= Collybia conigenoides Ellis), * on fallen cones of Magnolia acuminata (Tenn.)
Tricholoma panaeolus (Fr.) Quel. var. caespitosum Bres., Fairy ring around Lindera benzoin (Md.)
Volvariella bombycina (Schaeff. ex Fr.) Sing., * on various trees including Magnolia spp.

MONILIALES

Alternaria nelumbii Enlows & Rand, Leaf spot on Nelumbo lutea (Okla., Tex.)
Arthrobotrys sp., Nematode-capturing fungus occurring on submerged Liriodendron tulipifera wood
Beltraniana portoricensis F. L. Stevens & Patil., conidial state of Pseudomassaria carolinensis on Persea borbonia (S. C.)
Botrytis cinera Pers. ex Fr., * Gray mold blight on Aristolochia macrophylla (Conn., Md.)
Cercospora guttulata Ellis & Kellerm., Leaf spot on Aristolochia macrophylla (W. Va.), on Aristolochia sp. (Ill.)
Cercospora liriodendri Ellis & Harkn. [= Mycosphaerella tulipifera (Schw.) Higgins?], on Liriodendron tulipifera (N. J., W. Va.)
Cercospora magnoliae Ellis & Harkn. (= C. glauca Ellis & Everh. and Isariopsis magnoliae Plakidas). This is the conidial state of Mycosphaerella milleri; on Magnolia virginiana (N. J., N. C., S. C.)
Cercospora nelumbois Tharp, Leaf spot on Nelumbo lutea (Ind., Tex.)
Cercospora nymphaeacea Cooke & Ellis, on Nuphar luteum (Del., N. Y. **), on Nymphaea odorata (Ill., Ma., Mich., Mo., N. J., N. Y. **, Tex., Wisc.)
Cercospora purpurea Cooke, Leaf spot on Persea borbonia (Fla., Ga., Miss.)
Cercospora saururi Ellis & Everh., [? = Ramularia saururi (Ellis & Everh.) Tharp.]. Leaf spot on Saururus cernuus (Ala., Fla., Ill., Ind., La., N. Y. **, Tex.)
Cercospora serpentariae Ellis & Everh., Leaf spot on Aristolochia serpentaria (Ala., Conn., Del.)
Chaetochalara aspera Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Circinotrichum fertile Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Cladosporium fuscum Lida., on leaves of Magnolia virginiana (Md., N. J., N. Y.)
Codiumae gon-notrichodes Shearer & Crane, saprophytic on seeds of Liriodendron tulipifera (Ill., Ma.)
Coryne gelatinosa (Ellis & G. Martin) Rehm, on leaves of Persea borbonia (Fla.)
Cristariella pyramidalis Waterman & Marshal, on Asimina triloba and Lindera benzoin (W. Va.)
Cylindrocladium floridanum Sober & Seym., experimentally on Liriodendron tulipifera in Miss., naturally in N. C.
Cylindrocladium scoparium Morg., on fallen leaves of Asimina triloba (W. Va.)
 Dichotomophthoropsis nymphaearum (Rand) M. B. Ellis, on Brasenia schreberi, Nuphar luteum, and Nymphaea odorata (Minn.)
Eversia subopaca (Cooke & Ellis) Crane & Schoknecht (= Torula bigemina Cooke & Ellis, and Helminthosporium subopacum Cooke & Ellis), on Magnolia virginiana (N. J.)
Fusarium solani (Mart.) Appel & Wr., * canker on Liriodendron tulipifera
Graphium rubrum Rumbold, Pink wood stain of Liriodendron tulipifera (Ohio to Miss. and S. C.)
Helminthosporium fumosum Ellis & G. Martin, on leaves of Persea borbonia (Fla.)
Helminthosporium macrocarpum Gre., on Liriodendron tulipifera and Magnolia virginiana (Del.)
Isariopsis linderae (Ellis & Everh.) Sacc. (= Graphium linderae Ellis & Everh., Helminthosporium petersii Berk. & Curtis, in part), on leaves of Lindera benzoin (Ala., N. J., W. Va.)
Menisporopsis profusa Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Myocentrospora asininae (Ellis & Kellerm.) Deighton (= Cercospora asininae Ellis & Kellerm.), Leaf spot on Asimina triloba (Ala., Kans., Md., Miss., Tex.)
Myrothecium roridum Tode ex Fr., * on leaves of Asimina triloba (W. Va.)
Ocularia nymphaearum Allesch, Leaf spot on Nymphaea odorata (Wash.)
Phymatotrichum omnivorum (Shear) Dug., Root rot of Asimina triloba, Lindera benzoin, Liriodendron tulipifera, and Sassafras albidum (Tex.)
Ramularia liriodendri Ellis & Everh., Leaf spot on Liriodendron tulipifera (Ala., Del.)
Ramularia saururi (Ellis & Everh.) Tharp., Leaf spot on Saururus cernuus (Okla.)
Redbia elegans Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Rhopalocodium asininae (Ellis & Morg.) Petr. (= Phleospora asininae Ellis & Morg.), Leaf blotch on Asimina triloba (Ill., Ind., Kans., Mo., Ohio, W. Va.)
Scolecosbasidium dendroides Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Sirodesmium ellipticum (Cooke) Sacc. (= Coniosporium ellipticum ?), on leaves of Magnolia virginiana (S. C.)
Sporeidium rude Ellis, on leaves of Magnolia virginiana (N. J.)
Thozetella cristata Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Thozetella radiata (Morris) Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Thozetella tocklaiensis (Agnihotrudu) Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)
Torula ligniperda (Willk.) Sacc., Pink wood stain in Liriodendron tulipifera (widespread)
Uberispora simplex (Ichinde) Pirozynski & Hodges, on fallen leaves of Persea borbonia (S. C.)

**SPHAEROPSIDALES**

Actinopelte dryina (Sacc.) Höhn. (= Actinothyrium gloeosporioides Tehon), Leaf spot on Sassafras albidum (N. J., Ill.)
Asteroma liriodendri Cooke, on leaves of Liriodendron tulipifera (Md., S. C.)
Cytospora laxa Berk. & Curtis, on twigs of Calycanthus floridus (Md.)
Cytospora leucostoma Sacc. var. magnoliae D. Sacc., * on branches of Liriodendron tulipifera (Md. Va.)
Cytospora sassafras Ellis & Everh., on twigs of Sassafras albidum (Mich., N. Y., W. Va.)
Cytospora sassafraslicola Tehon & Daniels, on bark of Sassafras albidum branches injured by fire (Ill.)
Diploida linderae Ellis & Everh., on Lindera benzoin (N. Y.*)
Diplodia liriodendri Peck, on branches of Liriodendron tulipifera (Ala., N. Y., W. Va.)
Diplodia officinalis Ellis & Everh., on twigs and branches of Sassafras albidum (Mich., N. Y.)
Diplodia radicicola Tassi, perhaps the conidial state of Physalospora rhodina (Berk. & Curtis) Cooke, Root rot of Aristolochia serpentaria (Va.)
Diplodia sassafras Tracy & Earle, on twigs and branches of Sassafras albidum (Miss.)
Diplodia subcuticularis Dearn. & House, on twigs and branches of Sassafras albidum (N. Y. **)
Diploptelis sassafrasicolata Tehon & Stout (= Pycnoseynesia ?), on leaves of Sassafras albidum (Ill.)
Dothiorella aberrans Peck, on branches of Asimina triloba (Ohio)
Dothiorella asiminae Ellis & Everh., on Asimina triloba (W. Va.), probably the conidial stage of a Botryosphaeria
Dothiorella minor Ellis & Everh., on branches of Liriodendron tulipifera (Md., W. Va.)
Dothiorella nelumbii Ellis & F. W. Anderson, on flower parts of Nelumbo lutea (Del., Md.)
Dothiorella sp., canker on Liriodendron tulipifera (Pa.)
Gloeodes pomigena (Schw.) Colby, on twigs of Asimina triloba (Ind.), on branches of Lindera benzoin (Ind.), on branches of Liriodendron tulipifera (Ind., W. Va.), on branches of Sassafras albidum (Ind.)
Hendersonia linderae Sacc., on branches of Lindera benzoin (N. Y.**)
Leptothium kellerianii Bubak. (spermatial stage of Mycosphaerella sassafras ?), on dead leaves of Sassafras albidum (Ohio, Pa.)
Leptothium liriodendri Cooke, on leaves of Liriodendron tulipifera (S. C., W. Va.)
Microdiploidia linderae (Ellis & Everh.) Tassi, on branches of Lindera benzoin (Mich., N. Y.**)
Phaeostigme picea (Berk. & Curtis) Syd. (= Dimerium), on Magnolia virginiana (Ga.)
Phoma microsporella Karst. & Har., on leaves of Asimina triloba (Ind., Ohio)
Phoma tulipiferae Schw., on leaves of Liriodendron tulipifera (N. Y., Pa.)
Phomopsis sp. (= Diaporthe magnoliae Ellis & Everh.), on Magnolia virginiana (Fla.)
Phylllosticta asiminae Ellis & Kellerm., Bordered leaf spot or eyespot of Asimina triloba (Mo. to Tex., Mich., N. Y.**, Ohio)
Phylllosticta cookei Sacc., Leaf spot on Magnolia acuminata (W. Va.), on Magnolia virginiana (Fla., Miss., N. J., N. Y.**)
Phylllosticta fatisccens Peck, Leaf spot on Nuphar luteum (N. Y.**), and Nymphaea odorata (Ill., Iowa, N. J., N. Y.**, Wisc.)
Phylllosticta glauca Cooke, on Magnolia virginiana (Ala., Fla., N. C., S. C.)
Phylllosticta ilinoensis Tehon & Daniels, Leaf spot on Sassafras albidum (Ill., Mass.)
Phylllosticta linderae Ellis & Everh., Leaf spot on Lindera benzoin (Del., Ind., W. Va.)
Phylllosticta lindericola Ellis & Everh., Leaf spot on Lindera benzoin (W. Va.)
Phylllosticta liriodendri Cooke (= Phylllosticta liriodendrica Sacc., P. circumvallata Wint.), Leaf spot of Liriodendron tulipifera (conidial state of Mycosphaerella liriodendri) (widespread, N. Y.**)
Phylllosticta macrospora Ellis & Everh., on living leaves of Liriodendron tulipifera (N. Y.**, Pa., Va., W. Va.)
Phylllosticta magnoliae Sacc., on Magnolia virginiana (Fla., N. J.)
Phylllosticta micropuncta Cooke, Leaf spot on Persea borbonia (Md. to Fla., and Tex.)
Phylllosticta sassafras Cooke, Leaf spot on Sassafras albidum (N. Y. ** to Ga.)
Phylllosticta nymphaeacea Ellis & Everh., on Nuphar luteum (Ill., Tex.)
Phylllosticta nymphaeicola Tehon & Daniels, on Nuphar luteum (Ill.)
Phylllosticta perseae Ellis and G. Martin, on Persea borbonia (Fla.)
Pseudodictya sassafrasicolata Tehon & Stout, on leaves of Sassafras albidum (Ill.)
Septoria asiminae Ellis & Everh. (Nomen nudum ?), Leaf spot on Asimina triloba (Tex.)
Septoria sp., Leaf spot on Sassafras albidum (N. Y.)
Sphaeronaema magnoliae Peck, on dead twigs of Magnolia acuminata (N. Y.**, Pa.)
Sphaeropsis asiminae Ellis & Everh., on branches of Asimina triloba (Md., W. Va.)
Sphaeropsis linderae Peck [= Physalospora obtusa ?], on dead branches of Lindera benzoin (N. Y.**)
Sphaeropsis sassafras Cooke & Ellis (probably not a Sphaeropsis), on Sassafras albidum (N. Y.**)
Sphaeropsis spp. (probably conidial states of Physalospora spp.), cankers and dieback of Sassafras albidum (N.Y. to Ala. and Mo.)
MELANCONIALES

Gloeosporium affinis Sacc., on Sassafras albidum (Ill.)
Gloeosporium falcatum Dearn. & House, on leaves of Lindera benzoin (N. Y.*)
Gloeosporium liriodendri Ellis & Everh., Leaf spot of Liriodendron tulipifera (Conn., to N. J. and Tex.)
Gloeosporium sp. [= Glomerella cingulata (Ston.) Spauld. & Schrenk], Leaf spot on Aristolochia macrophylla (Mass.)
Melanconium magnoliae Ellis & Everh., on dead trunk of Magnolia virginiana (N. J.)
Myxosporium coloratum (Peck) Sacc., on twigs of Liriodendron tulipifera (N. Y.*)
Myxosporium liriodendri Dearn. & House, on twigs of Liriodendron tulipifera (N. Y.*)
Myxosporium longisporum Edg., on twigs of Liriodendron tulipifera (N. Y.)
Myxosporium megallanto Dearn., on dead branchlets of Liriodendron tulipifera (N. Y.)
Myxosporium tulipiferae Died., on twigs of Liriodendron tulipifera (Iowa)
Pestalotia spp., on leaves of Persea borbonia (generally distributed)
Septogloeum sp., on living leaves of Liriodendron tulipifera (N. Y.*)

MYCELIA STERILIA

Ectostroma liriodendri Kunze ex Fr., Tar spot on Liriodendron tulipifera (widespread, N. Y.*)
Rhizoctonia solani Kuehn., Seedling blight of Liriodendron tulipifera (Ohio, Va.)
Sclerotium sp., on Nuphar luteum and Nymphaea odorata (Minn.)
APPENDIX II

A list of Some Insects Associated with Plant Species in this Treatment.

ORTHOPTERA

Tettigoniidae

Conocephalus brevipennis (Scud.) on Nelumbo lutea

HEMIPTERA

Mesoveliidae

Mesovelia sp. on Nuphar luteum

Miridae

Lytgus oblineatus (Say) on Nelumbo lutea

HOMOPTERA

Cicadellidae

Jassus olitorius (Say) on Sassafras albidum

Cercopidae

Philaenus sp. on Nuphar luteum

Aphiidae

Aphis fabae (Scopoli) Bean Aphid on Aristolochia durior and Calycanthus floridus

Aphis gossypii Glover on Nelumbo lutea

Aphis maidis Fitch Corn Leaf Aphid on Nymphaea odorata

Aphis sp. on Asarum canadense

Macrosiphon liriodendri (Monell) Tulip tree Aphid on Liriodendron tulipifera, Magnolia acuminata

Nearctaphis bakeri (Cowen) Clover Aphid on Calycanthus floridus

Rhopalosiphum nymphaeae (L.), Waterlily Aphid on Ceratophyllum, Nuphar luteum, and Nymphaea odorata

Aleyrodidae

Aleyrodes asarumis (Shimer) on Asarum canadense

Coccidae

Aspidiotus camelliae Sign. Greedy Scale on Magnolia virginiana

Aspidiotus hederae (Vall.) Oleaner Scale on Magnolia (nursery stock)

Aspidiotus perniciosus Comstock, San Jose Scale on Sassafras albidum

Aspidiotus townsendi (Ckll.) on Liriodendron tulipifera

Cercoplastes floridensis Comstock, Florida Wax Scale on Magnolia (nursery stock)

Chionapsis lintneri Comstock on Lindera benzoin

Chionapsis salicis-nigrae (Walsh) on Liriodendron tulipifera

Chionapsis sylvatica Sanders on Lindera benzoin

Coccus hesperidum L. Soft Scale on Magnolia (nursery stock)

Icerya purchasi Mask. Cottony-cushion Scale, Fluted Scale on Magnolia (nursery stock)

Lecanuimum corni Bouché, European Fruit Lecanuimum Scale on Magnolia

Lepidosaphes beckii (Newm.) Purple Scale on Magnolia (nursery stock)

Lepidosaphes gloverii (Pck.) on Magnolia (nursery stock)

Lepidosaphes ulmi (L.) Oystershell Scale on Liriodendron tulipifera and Sassafras albidum
HEMIPTERA

Coccidae
Neolecanium cornutum Thro. Magnolia Scale on Magnolia
Parlatoria pergandii Comstock, Chaff Scale on Magnolia
Pseudococcus comstocki (Kuw.) Comstock Mealy-bug, on Magnolia
Saissetia oleae (Bern.) Black Scale on Magnolia (nursery stock)
Toumeyella liriodendri Gmelin on Liriodendron and Magnolia

COLEOPTERA

Cantharidae
Chauliognathus marginatus Fab. on Nuphar luteum
Chauliognathus pennsylvanicus (DeGeer) on Nelumbo lutea

Cleridae
Necrobia rufipes DeGeer on Nelumbo lutea

Mordellidae
Mordellistena sp. on Nelumbo lutea

Elateridae
Hypolitus obliquatus (Mels.) on Nelumbo lutea

Dermestidae
Anthrenus verbasci L. on Nelumbo lutea

Nitidulidae
Colopterus truncatus Rand. on Calycanthus
Meligethes sp. on Nuphar luteum

Coccinellidae
Hippodamia convergens Guerin on Nelumbo lutea
Hippodamia tridecimpunctata (Say) on Nelumbo lutea

Ptinidae
Ptinus sp. on Nuphar luteum

Scarabeidae
Popillia japonica Newman, Japanese Beetle on Sassafras albidum and Nelumbo lutea

Cerambycidae
Bellamira scalaris (Say) on Liriodendron tulipifera
Brachyleptura circundata (Olivier) on Magnolia flower
Centrodera decorata (Harris) on Liriodendron tulipifera
Charisalia americana (Haldeman) on Liriodendron tulipifera
Cyrtinus pygmaeus Hald. larva in Liriodendron tulipifera
Cyrtophorus verrucosus (Olivier) on Lindera benzoin and Liriodendron tulipifera
Elaphidion mucronatum (Say) on Asimina triloba, Liriodendron tulipifera and Sassafras albidum
Elaphidionoides villosus (Fab.) on Sassafras albidum
Encyclops caerulea (Say) on Liriodendron tulipifera
Heterachthes pallidus Haldeman on Liriodendron tulipifera
Heterachthes quadrinaculatus Fab. larva in Liriodendron tulipifera
Leptostylus aculifer Say larva in Liriodendron tulipifera
Leptura emarginata Fab. on Liriodendron tulipifera
Neoclytus acuminatus acuminatus (Fab.) on Liriodendron tulipifera and Sassafras albidum
Oberea ruficollis Fab. larva in Lindera benzoin and Sassafras albidum
Pidonia ruficollis (Say) on Magnolia flowers
Psenocerus supernotatus Say larva in Liriodendron tulipifera
Trachysida mutabilis (Newman) on Liriodendron tulipifera
Tylonotus bimaculatus Haldeman on Liriodendron tulipifera

Chrysomelidae
Diabrotica unidecimpunctata howardi Barber on Nelumbo lutea
Donacia cincticornis Newm. on Brasenia schreberi, Nuphar luteum, Nymphaea odorata
Donacia cincticornis Newm., var. tenuis Sf. on Brasenia schreberi and Nymphaea odorata
Donacia coerulea Oliv. on leaves of Nuphar luteum
Donacia edentata Sf. on flowers and leaves of Nymphaea odorata
Donacia liebecki Sf. on flowers and leaves of Nymphaea odorata
Donacia megacornis Blatch. on flowers and leaves of Nuphar luteum and Nymphaea odorata
Donacia militaris Lac. on flowers and leaves of Nymphaea odorata
Donacia palmata Oliv. adults and eggs on flowers and leaves of Nuphar luteum and Nymphaea odorata, larva in rhizomes of Nuphar
Donacia partidens Sf. on flowers and leaves of Nymphaea odorata
Donacia piscatrix Lac. on flowers and leaves of Nymphaea odorata and occasionally on Brasenia schreberi
Donacia proxima Kby. on flowers and leaves of Nuphar luteum
Donacia rufescens Lac. on flowers and leaves of Nymphaea odorata and occasionally on Brasenia schreberi
Donacia texana var. minor Sf. on Nuphar luteum
Epithrix cucumeris (Harris) Potato Flea Beetle on Nelumbo lutea
Pyrrhalta nymphaeæ (L.) Waterlily Leaf Beetle, on Nuphar luteum and Nymphaea odorata
Curculionidae
Odontopus calceatus Say Sassafras Weevil, on Sassafras albidum
Prionomerus calceatus Say larvae mining leaves of Liriodendron tulipifera and Sassafras albidum

LEPIDOPTERA

Lyonetiidae
Phyllocnistis liriodendrella Clemens larva on Liriodendron tulipifera and on Magnolia

Graciariidae
Graciaria sassafrasella Chambers larva and pupa on Sassafras albidum
Lithocelletis hamadryadella Clemens on Magnolia

Yponomeutidae
Urodus parvula Edwards larva on Persea borbonia

Tortricidae
Archips magnoliana Fernald larva on Magnolia acuminata
Phaecasiophora niveiguttata Grote larva on Sassafras albidum
Polychrosis liriodendrana Kearfott larva on Liriodendron tulipifera and Magnolia
Polychrosis liriodendrana Kearfott, var. magnoliana Kearfott larva on Liriodendron tulipifera and Magnolia
Sparganothis saracana Kearfott larva on Sassafras albidum

Pyralididae
Euzophera ostricolorella Hulst. larva in bark of Liriodendron tulipifera
Nymphula badiusalis Walker on Nelumbo lutea
Nymphula gyralis Hulst. larva on Nymphaea odorata
Nymphula maculalis Clemens larva on waterlilies and Brasenia, pupa generally under a floating waterlily leaf
Nymphula obliteralis Walker larva on waterlilies
Omphalocera cariosa Lederer larva boring in Asimina triloba
Pyrausta fissalis Grote larva and pupa on Sassafras albidum
Pyrausta penitalsis Grote larva on Nelumbo lutea and Nymphaea odorata

Sphingidae
Agrinus cingulata (Fab.) on Asimina triloba
Dolba hyleus (Drury) on Asimina triloba

Saturniidae
Antheraea polyphemus (Cramer) on Liriodendron tulipifera and Sassafras albidum
Automeris io (Fabricius) on Liriodendron tulipifera, Magnolia virginiana and Sassafras albidum
Callosamia (angulifera) Walker larva and pupae on Liriodendron tulipifera and Sassafras albidum
Callosamia carolina Jones on Liriodendron tulipifera and Magnolia virginiana
Callosamia promethea (Drury) larva on Linderia benzoin, Magnolia sp., Liriodendron tulipifera and Sassafras albidum
Hyalophora cecropia (L.) on Sassafras albidum
Samia cynthia (Felder and Felder) on Lindera benzoin and Liriodendron tulipifera and Sassafras albidum

Citheroniidae
Citheronia regalis (Fab.) Hickory Horned Devil, on Sassafras albidum
Eacles imperialis (Drury) on Lindera benzoin and Sassafras albidum

Arctiidae
Halisidota tessellaris (Abbot and Smith) on Liriodendron tulipifera
Hyphantria cunea (Drury) on Asimina triloba, Liriodendron tulipifera and Sassafras albidum

Noctuidae
Arzama obliqua (Walker) on Nelumbo lutea
Bellura gortynoides Walker on Nuphar luteum
Bellura melanopyga (Grote) on Nuphar luteum and Nymphaea odorata
Feltia duens Walker on Cabomba caroliniana
Helothis zeae (Fab.) on Sassafras albidum
Neoerastria caduca (Grote) on Nuphar luteum
Papapamea buffaloensis (Grote) on Saururus cernuus
Septis alia (Guenee) on Sassafras albidum
Zale calycanthata (Abbot and Smith) on Calycanthus floridus (N.J. and south)

Notodontidae
Datana drexeli Henry Edwards on Sassafras albidum

Liparidae
Hemerocampa leucostigma (Abbot and Smith) on Asimina triloba, Liriodendron tulipifera and Sassafras albidum
Liparis dispers (L.) on Lindera benzoin and Liriodendron tulipifera and Sassafras albidum

Zanolidae
Apatelodes torrefacta (Abbot and Smith) on Asimina triloba, Lindera benzoin and Sassafras albidum

Geometridae
Abbotana clemataria (Abbot and Smith) on Sassafras albidum
Epimecis virginaria (Cramer) on Liriodendron tulipifera, Persea borbonia and Sassafras albidum
Erannis tiliaia (Harris) on Liriodendron tulipifera
Metarranthis broweri Rupert on Sassafras albidum
Metarranthis hypochria (Herrick-Schaetter) on Sassafras albidum
Tetracis crocallata Guenee on Lindera benzoin

Papilionidae
Battus philenor (L.) on Asarum canadense, Aristolochia durior and A. serpentaria
Graphium marcellus Cramer Zebra Swallowtail on Asimina triloba and Lindera benzoin
Papilio cresphontes Cramer Giant Swallowtail on Persea borbonia
Papilio glaucus L. Tiger Swallowtail on Lindera benzoin, Liriodendron tulipifera, Magnolia acuminata and Sassafras albidum
Papilio palamedes Drury on Persea borbonia and Sassafras albidum
Papilio troilus L. Blue Swallowtail on Lindera benzoin, Magnolia virginiana and Sassafras albidum

Nymphalidae
Polygona interrogationis (Fabricius) on Liriodendron tulipifera

DIPTERA

Chironomidae
Cricotopus sp. on Nelumbo lutea

Cecidomyiidae
Cecidomyia hageni Aldr. Leaf gall on Aristolochia macrophylla
Cecidomyia tulipiferae O.S. Tulip-tree Midrib Gall on Liriodendron tulipifera
Cecidomyia sp. on Lindera benzoin
Cecidomyia sp. Tulip-tree Vein Gall on Liriodendron tulipifera

Dasineura sassafras Felt on Sassafras albidum

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Lasioptera linderae Beutm. Spicebush Stem Gall on Lindera benzoin
Neolasioptera liriodendri (Felt) on Liriodendron tulipifera

Cecidomyiidae
Thecodiplosis liriodendri O.S. Tulip-tree Spot Gall on Liriodendron tulipifera

Tabanidae
Chrysops sp. on Nelumbo lutea

Syrphidae
Allograpta obliqua Say on Nelumbo lutea
Eristalis tenax (L.) on Nelumbo lutea
Eristalis sp. on Nelumbo lutea and Nuphar luteum
Helophilus divisus Loew. on Nelumbo lutea
Parhelelophilus laetus (Loew.) on Nelumbo lutea
Sphaerophoria cylindrica (Say) on Nelumbo lutea
Sphaerophoria sp. on Nelumbo lutea
Sphecoemyia sp. on Nelumbo lutea
Syrophus rectus (Osten Sacken) on Nelumbo lutea

Calliphoridae
Calliphora vomitoria L. on Nuphar luteum

Musciidae
Limnophora naroma (Walker) on Nelumbo lutea

Scatophagidae
Scatophaga sp. on Nuphar luteum

Ephydridae
Hydrellia sp. on Nelumbo lutea
Notiphilia sp. on Nuphar luteum

Chloropidae
Eriobolis longulus (Loew.) on Nelumbo lutea

HYMENOPTERA

Andrenidae
Andrena carlini carlini Cockerell on Sassafras albidum
Andrena salictaria Robertson on Sassafras albidum
Andrena ceanothi Viereck on Sassafras albidum
Andrena forbesii Robertson on Sassafras albidum
Andrena hippotes Robertson on Sassafras albidum

Halictidae
Agapostemon radiatus (Say) on Nelumbo lutea
Agapostemon virescens (Fab.) on Nymphaea odorata
Augochlorella striata (Provancher) on Nelumbo lutea
Dialictus cressonii (Robertson) on Sassafras albidum
Dialictus illinoensis (Robertson) on Sassafras albidum
Dialictus inconspicuus (Smith) on Nelumbo lutea and Sassafras albidum
Dialictus nymphaearum (Robertson) on Nelumbo lutea and Nymphaea odorata
Dialictus zephyrus (Smith) on Sassafras albidum
Dialictus sp. on Nelumbo lutea
Ecylaeus arcuatus (Robertson) on Sassafras albidum
Ecylaeus nelumbonis (Robertson) on Nelumbo lutea, Nuphar luteum, and Nymphaea odorata
Ecylaeus pectoralis (Smith) on Nuphar luteum
Halictus rubricundus (Christ) on Nelumbo lutea and Sassafras albidum
Lasiosglossum zonulum (Smith) on Nelumbo lutea
Sphecodes dichrous Smith on Sassafras albidum
Sphecodes minor Robertson on Sassafras albidum
Megachilidae
  *Osmia pumila* Cresson pollinating *Sassafras albidum*

Apidae
  *Apis mellifera* L. Honey Bee on *Nelumbo lutea* and *Nuphar luteum*
  *Bombus bimaculatus* Cresson on *Nelumbo lutea*
  *Bombus impatiens* Cresson on *Nelumbo lutea*
  *Bombus pennsylvanicus* (DeGeer) on *Nelumbo lutea*
  *Bombus vagans* F. Smith on *Nelumbo lutea*


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