

## GINKGOACEAE

*Ginkgo biloba* Linnaeus

### Ginkgo · Maidenhair Tree

**Size and Form.** Medium-sized tree, 15–25 m (50–80 ft) high and 20–40 cm (8–15 in) in diameter. Slender, spirelike tree in youth, excurrent form with a straight, strongly tapering trunk and short lateral branches; with age the lower branches grow out horizontally and the crown becomes more spreading. Michigan Big Tree: girth 373 cm (147 in, 12.2 ft), diameter 119 cm (47 in), height 24.4 m (80 ft), Hillsdale Co.

**Bark.** Thick, ash gray and somewhat roughened; becoming fissured with age.

**Leaves.** Clusters of 3–5 at the ends of short shoots or separated alternately on long terminal shoots; alternate; simple; blade 3–5 cm long, 4–8 cm wide; fan-shaped, usually bilobed and irregularly crenate at the upper extremity; thin and leathery; glabrous; flushing bright yellow green, becoming dark green, turning a clear, golden yellow in autumn and shed within a day or two following severe frost; veins fine, parallel, and forking one or more times from the base, no midvein; petioles long, slender.

**Twigs.** Stout, gray brown, glabrous; leaf scars raised, half round with 2 bundle scars.

**Winter Buds.** Terminal bud about 3 mm long, flat-conic, smooth, light red brown; lateral buds divergent, usually only on rapid-growing shoots.

**Wood.** Light, soft, weak, close-grained, yellow white to light red brown, with thin, lighter-colored sapwood.

**Male Reproductive Structure.** May, with the leaves; catkins short-stalked, pendulous, 3–6 cm long, thick, and yellow. Trees dioecious.

**Female Reproductive Structure.** May; like tiny, long-stalked acorns, 1–2 cm on 4 cm pedicels, consisting of 2 naked ovules, one of which usually aborts. Wind-pollinated. Ripening in autumn, a globose drupelike structure (actually a seed covered by a pulpy outer coat), orange yellow to green, 2.5–3 cm in diameter, consisting of an acrid, putrid-smelling pulp enclosing a smooth, whitish, somewhat flattened, almond-flavored seed.

**Distribution.** Possibly naturally occurring in mountains of eastern China, Anhui and Zhejiang Provinces (Del Tredici 1991). Introduced from England into Philadelphia

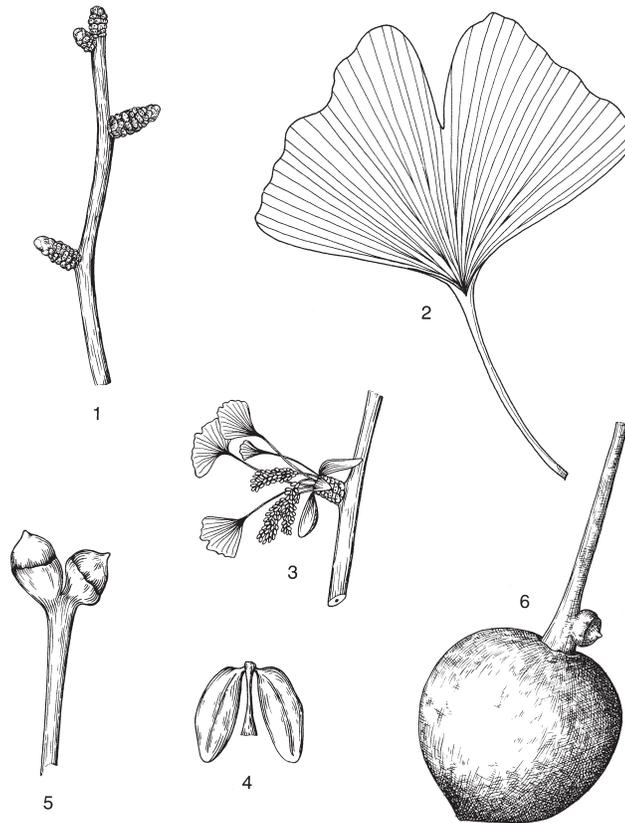
in 1784. Frequently planted in city parks and on lawns. Hardy in the southern half of the Lower Peninsula and the southern parts of the western Great Lakes region.

**Habitat.** Shade tolerant but grows well in full sun; thrives on a wide range of well drained soils.

**Notes.** Ginkgo is the sole surviving genus of an ancient order of plants having characteristics of both ferns and conifers. Ginkgo flourished in many parts of the world in the late Mesozoic, about 150 million years ago, until its extinction in all areas except China. Ginkgo has a documented history of cultivation by the Chinese for nearly 1,000 years, but natural populations are no longer known to exist. Because of its religious significance, it was cultivated around temples and shrines in China and Japan, often reaching enormous sizes and ages of more than 300 years. It was planted widely for edible and medicinal purposes and to honor longevity. The oldest individual, a female tree in Shandong Province, China, is reported to be approximately 3,000 years old (Del Tredici 1991). Ginkgo is extensively cultivated in temperate countries in parks and as street trees because of its high resistance to insect pests and diseases. However, enthusiasm for widespread street plantings faded early in the twentieth century when the trees reached sexual maturity. Female trees started producing large quantities of seeds, which when trampled by foot traffic resulted in a foul-smelling mess. The odor is variously referred to as “offensive,” “disgusting,” “repulsive,” “nauseating,” and “abominable.” Thus, only male trees are recommended for planting. Slow-growing; very long-lived; little harmed by air pollutants. Easily propagated from seed and cuttings. Early Chinese names were duck’s feet (because of the leaf shape) and silver apricot (because of the whitish seed). The name “ginkgo” is a transliteration of the Chinese ideograph of “yin hsing” (silver apricot). See Li 1963 and Del Tredici 1991 for historical notes.

**Chromosome No.**  $2n = 24$ ,  $n = 12$ ;  $x = 12$

## Ginkgo · Maidenhair Tree



1. Winter twig, with short shoots  $\times \frac{1}{2}$ .
2. Leaf,  $\times \frac{1}{2}$ .
3. Pollen-bearing twig,  $\times \frac{1}{2}$ .
4. Pollen sacs, enlarged.
5. Unfertilized seed twig, enlarged.
6. Mature fleshy seed,  $\times 1$ .

### Key Characters

- fan-shaped leaves borne in clusters on short, spur shoots
- strongly excurrent form with straight trunk and horizontal lateral branches
- female trees with malodorous pulpy covering of the seed
- planted in urban environments

## PINACEAE

*Abies balsamea* (Linnaeus) Miller

### Balsam Fir

**Size and Form.** Medium-sized tree, 12–25 m (40–80 ft) high and 25–45 cm (10–18 in) in diameter. Slender, symmetrical, excurrent form with a narrow, spire-topped pyramidal crown; in closed stands dead branches persist below the live crown. Root system shallow on heavy-textured soils and poorly drained sites, moderately deep on more porous and better-drained soils. Michigan Big Tree: girth 213 cm (84 in), diameter 68 cm (27 in), height 35.3 m (116 ft), Ontonagon Co.

**Bark.** Thin and smooth on young trunks, dull green to pale grayish brown and marked by raised resin blisters; reddish brown on old trunks and somewhat roughened by small irregular scaly plates.

**Leaves.** Spiral, but often appearing 2-ranked in flattened sprays in the lower crown and under shaded conditions, in upper crown under full sun the needles curve upward and appear bushy and sprucelike; 1.3–3 cm long, sessile; narrowly linear, becoming shorter and thicker in full sunlight of upper crown position; apex rounded or notched; lustrous, dark green above, pale beneath due to numerous white lines of stomata; aromatic; persistent 8–10 years.

**Twigs.** Slender, at first grayish and pubescent, becoming grayish brown and smooth; leaf scars distinctive, flush with surface, roundish.

**Winter Buds.** Globose, orange green, resinous, small, 3–6 mm in diameter.

**Wood.** Very light, soft, weak, coarse-grained, perishable, pale brown, with thick, lighter-colored sapwood. Uses include pulpwood, boxes, crates, sashes, general construction lumber, woodenware.

**Pollen Cones.** May; oblong-cylindrical, 6 mm long, composed of yellow pollen scales. Trees monoecious.

**Seed Cones.** Young cones in May; wind-pollinated; oblong-cylindrical, located on the topmost branches of the crown, 2.5 cm long, composed of orbicular, purple ovule scales (subtended by yellowish green bracts) spirally arranged upon a central axis. Ripening in autumn of first season; oblong-cylindrical, erect, finely hairy, dark purple, 5–10 cm long and 2.5 cm in diameter; very resinous; woody

scales deciduous in autumn, only the woody cone axis persistent on uppermost branches in winter; seeds 6 mm long, much shorter than their light brown wings.

**Distribution.** Abundant in the Upper Peninsula; common in the northern half of the Lower Peninsula; absent in the southern half of the Lower Peninsula except for a sphagnum bog in Ingham Co. and ornamental plantings.

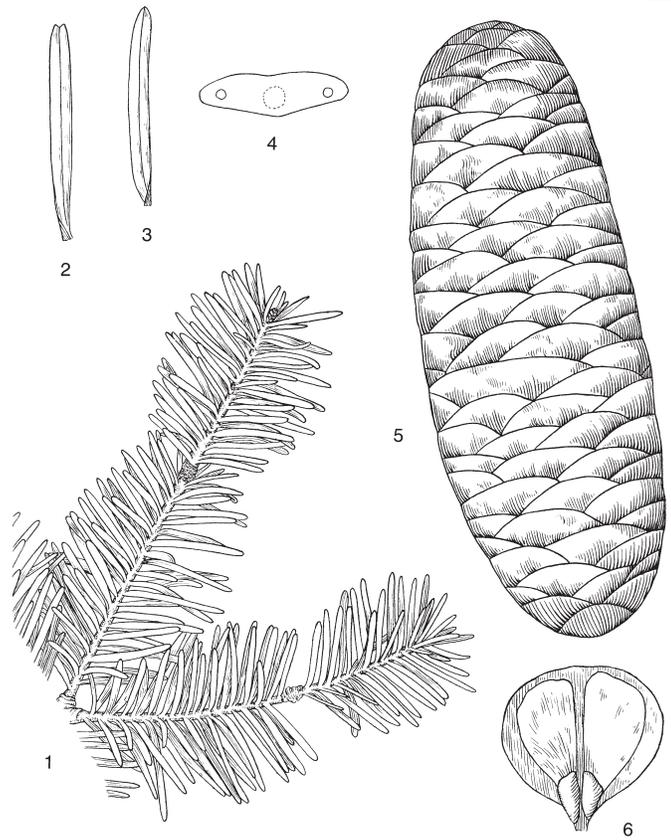
**Habitat.** Characteristic of the cold, wet boreal forest of Canada but occurring in a variety of sites in Michigan and the western Great Lakes region from cold, poorly drained swamps to well drained uplands. Less tolerant of poorly drained conditions, less tolerant of fire, and more tolerant of warmer and drier climate than the spruces. Frequent associates include white spruce, black spruce, trembling aspen, red maple, yellow and white birches.

**Notes.** Very shade-tolerant; slow-growing; short-lived. Germination epigeal. Seedlings often found in the understory of disturbed forests where they grow slowly and may persist for many years. Severely attacked by the spruce budworm (*Choristoneura fumiferana*), especially mature and overmature trees; susceptible to heart rots. An excellent Christmas tree because of long-persistent needles that are not shed readily. Aromatic needles prized for making balsam pillows. Young and medium-aged trunks are characterized by rounded blisters in the bark; these are full of clear, aromatic resin and may be broken with the fingernail.

**Chromosome No.**  $2n = 24$ ,  $n = 12$ ;  $x = 12$

**Similar Species.** Closely related to Fraser fir, *Abies fraseri* (Pursh) Poir., of the southern Appalachian Mountains. Most closely related to grand fir, *A. grandis* (Dougl. ex D. Don) Lindl., and subalpine fir, *A. lasiocarpa* (Hook.) Nutt., of the many western North American firs. A similar tree in central Europe is silver fir, *A. alba* Mill. In Japan, Saghalin fir, *A. sachalinensis* Mast., and Veitch fir, *A. veitchii* Lindl., are similar.

**Balsam Fir**



1. Winter shoot,  $\times 1$ .
- 2-3. Leaves,  $\times 2$ .
4. Cross section of leaf, enlarged.
5. Unopened cone,  $\times 1$ .
6. Cone scale with seeds,  $\times 1$ .

**Key Characters**

- 2-ranked needles, soft, apex rounded or notched; needles leaving a flush, roundish leaf scar
- bark smooth, dull green to gray, with resin blisters
- seed cones erect, scales deciduous, woody cone axis persistent in upper crown

**PINACEAE**

*Abies concolor* (Gordon and  
Glendinning) Lindley

**White Fir**

**Size and Form.** Medium-sized tree, 12–22 m (40–70 ft) high and 30–50 cm (10–20 in), but reaching large tree size in its native western range. Trunk straight, crown oval or cylindrical, rather open; branches tend to bend downward and may reach the ground when tree is open-grown. Roots shallow and wide spreading. Michigan Big Tree: girth 224 cm (88 in), diameter 71 cm (28 in), height 28 m (92 ft), Ionia Co.

**Bark.** Thin, smooth, dark gray, many resin blisters; becoming relatively thick scaly and finally broken into fissures with flat, dark gray ridges.

**Leaves.** Spirally arranged in rows extending nearly horizontally from all sides of the branch, more or less 2-ranked; 4–7 cm long, sessile; linear, flattened, thick, leathery, apex rounded or acute; tangerine- or orangelike odor when crushed; uniformly silvery blue gray both sides; persistent 8–10 years.

**Twigs.** Moderately stout, grayish and pubescent, becoming grayish brown and smooth, leaf scars distinctive, flush with surface, roundish.

**Winter Buds.** Globose, yellowish brown, very resinous.

**Seed Cones.** Young cones in May; wind-pollinated; ripening in autumn of first season; oblong, domed, erect, smooth, bracts shorter than scales, olive green tinged with purple, 8–12 cm long; very resinous; at top of tree only; woody scales deciduous, woody cone axis persistent on uppermost branches in winter. Trees monoecious.

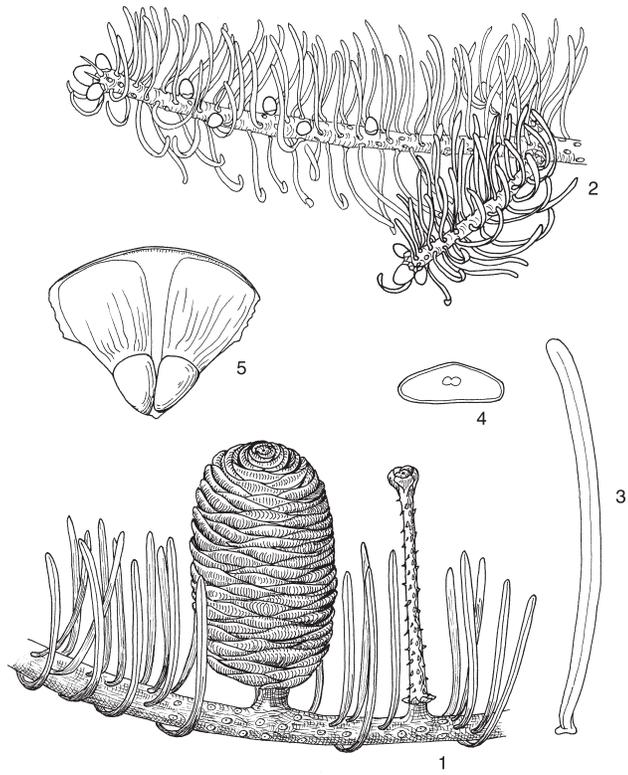
**Distribution.** Native in Rocky Mountains and Sierra Nevada of California. Occasionally planted as a park or lawn tree.

**Habitat.** Grows well on most upland soils; hardy.

**Notes.** Shade-tolerant, slow-growing, long-lived. Germination epigeal. An important ornamental tree because of its graceful form and large sprays of glaucous, bluish-gray foliage. Probably able to tolerate the relatively warm climate of southern Michigan and Wisconsin due to its genetic adaptation to relatively dry sites and soil-water stress throughout much of its Sierra Nevada and Rocky Mountain range.

**Chromosome No.**  $2n = 24$ ,  $n = 12$ ;  $x = 12$

**White Fir**



1. Winter shoot with leaves, cone, and cone axis,  $\times \frac{1}{2}$ .
2. Winter shoot with buds,  $\times \frac{1}{2}$ .
3. Leaf,  $\times 1$ .
4. Cross section of leaf,  $\times 5$ .
5. Cone scale with seeds,  $\times 1$ .

**Key Characters**

- leaves silvery bluish gray both sides
- leaves long, 4–7 cm, thick-leathery
- leaf scars flush with twig, roundish
- seed cone scales deciduous, woody cone axis persistent on top branches