



Tulip Poplar

Liriodendron tulipifera L.

Plant Symbol = LITU

Alternative Names

Common Names: tuliptree, tulip poplar, yellow poplar, tulip magnolia, whitewood

Description

General: The tulip poplar or tuliptree, is a large, fast-growing, long-lived, deciduous tree native to eastern North America. Despite its common name, tulip poplar is not a poplar and instead, belongs to the Magnolia family (Magnoliaceae). The tree has a pyramidal or oval-shaped crown when young that gradually becomes more rounded as it matures. Tulip poplar has a long straight single stem with few to no branches upwards to 50 feet in natural environments. Like true poplars (*Populus* spp.), willows (*Salix* spp.), and maples (*Acer* spp.), the tulip poplar sheds branches in a normal annual process of self-pruning. In ornamental or landscape environments, the tree retains many lower limbs but still exhibits a self-pruning habit, though not as extreme.

The tulip poplar is among the tallest broadleaf trees in eastern US forests (Beck & Della-Bianca, 1981). It can grow 70–120 feet tall, with the crown spreading 40–50 feet wide (Dirr, 2009; Dickerson, 2002). The 2021 U.S. National Champion in Virginia measured 139 feet (American Forests, 2021). Some previous records indicate trees taller than 190 feet (Blozen, 2011). The tree trunk is usually 2–5 feet in diameter but can be much as 8–12 feet (Beck & Della-Bianca, 1981).

The bark on young trees is smooth and light gray to grayish brown with white lenticels. As the tree matures the bark thickens and the lenticels expand resulting in deeply furrowed and interlacing bark (similar to oak (*Quercus* spp.) and ash (*Fraxinus* spp.) bark). The bark of mature tulip poplar trees has light colored furrows contrasted with darker thick ridges that expand outward.

Branches are ascending with a somewhat horizontal orientation forming a broad, conical crown. Stems are slender to stout, greenish to red-brown, arranged alternately, and aromatic when broken (Dirr, 2009). Distinctive stipular scars surround each stem where previous year's growth emerged. Tulip poplar trees are usually among the first to leaf out in spring. New leaves emerge from flat, duck-bill shaped buds and are bright green and shiny. Leaves are tulip shaped, smooth on both surfaces, alternate, simple, 3–8 inches across and as long, with a 2–4 inch-long petiole (Dirr, 2009; Dickerson, 2002). The long petiole causes the leaves to twist and flutter in windy conditions, characteristic of a poplar tree. Tulip poplars reliably turn a golden yellow color in fall before senescence.

It takes tulip poplar 12-20 years to bloom. A teacup shaped perfect flower emerges in late April to June. Flowers often go unnoticed because they most often develop in the upper and outer canopy of the tree and their color blends in with the leaves. Flower buds are protected by green bracts (sepals) that open to reveal 6 green petals that fade to a pale yellow with a bright



Figure 1. Tulip poplar tree located at the Rose Lake Plant Materials Center in East Lansing, MI in summer (top) and fall (bottom). Photos by MIPMC.

orange center. Many stamen (20-50) surround a yellow column (style) with a central stigma that will later develop into the brown cone-like aggregate of samaras (Meyer, 2020; Dirr, 2009). The flowers are heavy nectar producers that emit a honey-like fragrance that is attractive to insects and people.

Tulip poplar produce thousands of wind-dispersed seeds that fall from mid-October to early spring. A single young tree can produce several hundred cones and about 40,000 seeds (Beck, 1990). Some seed crop measurements indicate that seed fall in mixed forest stands can range between 300,000 and 600,000 seeds per acre (Beck, 1991). Cleaned seed will yield about 14,000 seeds per pound (Dirr & Heuser, 2006). Despite these high seed production rates, viability of the seed is low and ranges from 5–20% with some research reporting rates as low as 1.5% (Beck, 1990; Davis & Kujawski, 2001). The seeds can remain viable under favorable environmental conditions for 4-7 years (Beck, 1990). While not tolerant of shade, tulip poplar can quickly colonize open and disturbed areas.



Figure 2. Yellow tulip poplar blossoms in late spring at the Rose Lake Plant Materials Center in East Lansing, MI. The blooms open to reveal several stamen surrounding a yellow column that will develop into seeds. Photos by MIPMC.

Distribution: Tulip poplars native range comprises the eastern United States and Ontario, west to Michigan, and south to Louisiana. It is not uniformly distributed across this native range. Population densities are highest in the Ohio River basin and along the Appalachian Mountain range. Trees found in these areas are typically larger than those found in other parts of the tree's native range (Beck, 1990). Tulip poplar is most often found in USDA Cold Hardiness Zones 4-9. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Habitat: Tulip poplar is most often found on lower slopes of north or east facing mountains but can also be found in protected coves and on gentle slopes (Beck, 1990). The tree is a facultative upland (FACU) plant indicating that the plant is not generally found in wetlands (NWPL, 2020). The tree is an important species in many forest systems and is often associated with oak, pine, and hemlock, among other species. Pure stands of the tree make up only a very small percentage of the native range and are found in high quality sites or abandoned fields (Beck, 1990).

Adaptation

The tree grows best in full-sun locations where soils are deep, rich in nutrients, moderately moist, and well-drained. Ideal soil textures range from loamy to gravelly and will tolerate soil pH of 4.5–8.2 (Dickerson, 2002; Cregg & Schutzki, 2016). Tulip poplar will thrive in areas where precipitation is evenly distributed throughout the growing season. It is tolerant of many growing conditions and has been used in temperate landscape settings outside of its native range, including across much of Western Europe. First introduced to Britain in the 17th Century, the tree is a common specimen plant in estate gardens and parks (Ballard, n.d.). Collections around the world, from Finland to Argentina, exhibit the range of conditions the tree can tolerate (Lori et al., 2004; CABI, 2019). Despite the extensive range of the tree, it does not tolerate flooding, drought, or soils that are high in calcium carbonate (CaCO₃) or salts (Beck, 1990). Fire can negatively affect sapling growth, but mature trees are very tolerant (Beck, 1990).

Uses

Timber/wood: Because of its fast and straight growth, tulip poplar (known as yellow poplar in the lumber industry) is commercially valuable and is used for construction grade lumber, plywood, and pulpwood (Griffith, 1991; Beck, 1990; Beck & Hooper, 1986). In addition, it is used in cabinetry making, for furniture and shingle making, and as veneer wood (Beck & Della-Bianca, 1981). While tulip poplar wood dries quickly and splits easily, it is only considered fair quality firewood because it burns quickly (Griffith, 1991).

Urban forestry/ornamental/shade: Tulip poplar makes a good ornamental and landscape tree when adequate space is available. The fast-growing nature, unique leaf and flower shape, fall color, and broad adaptability make this a highly sought-after and attractive tree. However, the tree is susceptible to storm damage and the self-pruning habit can lead to small branch and twig loss. The mass production of hard and sharp samaras quickly accumulates in landscape spaces and can be painful when stepped on. Due to the mature size of most tulip poplar cultivars and the required space away from structures to prevent damage, the tree may not be an efficient energy saving option for residential landscapes. When using as a street tree, proper planning should consider the mature tree size, pests and diseases, and environmental conditions such as car exhaust and other forms of ozone producing pollution. Tulip poplars are highly sensitive to ozone and will exhibit leaf injury (stippling, yellowing, curling, and/or defoliation) which, in extreme cases, may lead to plant failure (Davis et al., 1981; Griffith, 1991).

Carbon sequestration: Tulip poplar is long lived and adapted to many growing conditions making it a valuable tree for sequestering carbon. Research of old-growth forest stands indicate stands dominated by tulip poplar store high rates of carbon in the living above ground plant parts (McGarvey et al., 2015). As such, existing and planned tulip poplar stands may be eligible for carbon credit or offset programs used by landowners and farmers (USDA, 2023).

Livestock and Wildlife: Tulip tree is used to shade pastures. The leaves and stems are palatable to livestock with some research indicating that tulip poplar leaf meal may be used as a feed source for ruminants (Griffith, 1991; Smith, 2010). If the trees experience heavy browsing young trees may not survive. Deer will also browse tulip poplar year-round. Samaras are consumed by rabbits, squirrels, other rodents, and some birds (Griffith, 1991). The tree sap attracts yellow-bellied sapsucker (*Sphyrapicus varius*) and mature trees will often have an observable horizontal line of sapsucker holes. The flower nectar is sought out by ruby-throated hummingbirds (*Archilochus colubris*) as well as many insects.

Ethnobotany

The Cherokee People used the tulip tree to treat stomach issues, pain, fever, dermatological conditions, and snake bites (Hamel & Chiltoskey, 1975; Moerman, 1998). The Rappahannock Tribe is also reported to have used tulip poplar for pain and as a stimulant (Speck et al., 1942). Because of the long straight habit of the tree trunk, it was also used to make dugout canoes. For this reason, it is sometimes referred to as the “canoe tree”. According to the Arbor Day Foundation, Daniel Boone reportedly used a tulip poplar canoe to traverse waterways.

Status

Wetland Indicator: FACU – Facultative upland plant (nonhydrophyte). Tulip poplar is most often found in non-wetland locations but may occasionally be found in wetlands.

Weedy or Invasive: Tulip poplar is generally not considered weedy. Please consult the PLANTS Web site (<http://plants.usda.gov/>) and your State Department of Natural Resources for this plant’s current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

Planting Guidelines

Tulip poplar is a fast-growing and adaptable tree that is propagated most often from seed but can also be propagated from softwood cuttings and stump sprouts. Cultivars are grafted on seed propagated rootstock. Seedlings and saplings are sold bare-root or containerized and are widely available. These can be planted from spring to early fall if adequate water is available. Larger containerized or balled-and-burlapped trees should be planted in spring and will need to be supported for 1-3 years. Direct seeding is not recommended due to low seed viability and irregular length of dormancy (Beck & Della-Bianca, 1981). Containerized and bareroot trees benefit from root pruning. Root pruning can increase transplant success but the fleshy roots should not be permitted to dry out (Beck & Della-Bianca, 1981). In addition, the above ground portion of the plant should also be pruned to balance any root pruning. Tulip poplar has a deeply penetrating taproot with spreading lateral roots and should be given ample space (Beck, 1990). Planting holes should be 2–3 times the width and slightly deeper than the tree root ball. Backfill with loose soil, add 3–5 inches of mulch to retain soil moisture and inhibit weed growth, and water deeply. Ensure the root flare is visible at the soil line and keep mulch 2–6 inches away from the trunk of the tree. Depending on location, the tree may need supplemental water until established, usually 3–5 years. Tulip poplar thrive in full sun, though in dry climates some shading may be beneficial. While tolerant of a variety of soil conditions, it is best planted in loose loamy soils that have a slightly acid to neutral pH. Soils high in pH can cause plant stress making the tree more susceptible to pests and diseases, especially aphids and sooty mold (*Capnodium citri*) (Brough & Weber, 2002).

Management

After establishment, tulip poplar needs little care. Pruning is not recommended unless branches are dead, dying, or hazardous as wounds can leave the tree susceptible to wood rots. During periods of drought, supplemental irrigation is required. Symptoms of drought stress include leaf scorch, yellowing, and leaf drop of interior leaves. Supplemental nutrition is generally not needed or recommended. In some landscape settings, fertilization may be required to optimize the overall health of the plant, but do not over-fertilize. Overfertilization can increase the risk for plant pests and diseases. Contact your local Extension Service for recommendations specific to your location. Because of its fast growth and abundant seed production, tulip poplar can outcompete other slower growing tree species. Vining plants, especially non-native vining plants, can negatively impact the growth of tulip poplar. Management may be required to remove competition (Beck, 1990).

Pests and Potential Problems

Tulip poplar is considered moderately to very resistant to major pests, diseases, and problems. However, when environmental conditions are favorable to pest or disease development, tulip poplar can be susceptible to canker, leaf spot, and rot pathogens. Some notable fungal pathogens include *Fusarium solani* (canker), *Armillaria mellea* (rot), *Verticillium* spp. (wilt), and *Nectria* spp. (canker) (Beck, 1990; Dirr, 2009; Dickerson, 2002). The tree is also susceptible to insect pests such as

yellow-poplar weevil (*Odontopus calceatus*), tuliptree scale (*Toumeyella liriodendra*), and tuliptree aphids (*Illinoia liriodendri*) (Beck, 1990; Dickerson, 2002). Likely the most significant challenge that landscape managers face with tulip poplar is the tuliptree aphid and tuliptree scale. These insects have piercing-sucking mouthparts and feed on the sugar laden tree sap. The sugars pass through their systems and are deposited on the leaves in large amounts, creating a wet, sticky substance (frass) that drips onto surfaces below the tree. This can cause sticky residue to accumulate on lower limbs, other plants, cars, building, and pavement which can cause permanent damage or staining. In addition, the residue creates a highly favorable environment for opportunistic, non-pathogenic fungi that can create a dark fungal mat on the leaves and branches of the tree and surrounding plants called sooty mold. Sooty mold is unsightly and can inhibit photosynthesis in the plant, reducing plant health and vigor. Tuliptree aphids and tuliptree scale feed on and affect trees that are stressed. These insect pests are best managed by ensuring plant health through good irrigation and nutrient management practices. Contact your local Extension Service for management recommendations specific to your location.

Environmental Concerns

There are no known environmental concerns associated with tulip poplar.

Seeds and Plant Production

Seed should be cold stratified in moist sand or peat for 60–90 days at 41°F (Dirr, 2009). Low germination rates should be expected based on poor seed viability. Seeds should be sown in a clean seed bed or a germination mixture at 60–70°F for about 6 weeks. Propagative material collected from mature trees have lower rooting success rates than those collected from young trees (Dirr & Heuser, 2006). The best time to take softwood cuttings is in mid-summer using a basal cut 1/2 inch below the node and dipped in 0.5% IBA (Toogood (Ed.), 1999; Dirr & Heuser, 2006; Brough & Weber, 2002). Cultivars are whip grafted or side spliced onto 2-year-old seedlings, with some professionals suggesting chip budding as an option as well (Dirr & Heuser, 2006; Brough & Weber, 2002).

Cultivars, Improved, and Selected Materials (and area of origin)

There are several cultivars of tulip poplar with varying availability. Dwarf cultivars such as ‘Ardis’ and ‘Little Helper’ are 1/3 the size of a standard tulip poplar, reaching only 30 feet. The height and leaf size of a lesser-known cultivar ‘Compactum’ are only half the standard size (Dirr, 2009). Dwarf cultivars may be a good option for residential gardens where space is limited. Columnar cultivars include ‘Arnold’ and ‘Fastigiatum’ (Dirr, 2009; UConn Plant Database, 2015). These cultivars are narrow forms that are approximately 15 feet wide while still retaining heights of 50 feet or more. Columnar cultivars for tulip poplar are difficult to find for purchase (UConn Plant Database, 2015). Variegated cultivars such as ‘Aureomarginatum’ (sold as ‘Flashlight’ or ‘Majestic Beauty’), ‘Mediopictum’, and ‘Snow Bird’ display a range of leaf color from yellow centers to white edges. These cultivars tend to be smaller, only reaching approximately 50 feet and can be difficult to find for purchase. In addition, they are more sensitive to drying site conditions and their leaves are susceptible to desiccation. Cultivars should be selected based on the local climate, resistance to local pests, and intended use. Consult with your local land grant university, Extension, or USDA NRCS office for recommendations on adapted cultivars for use in your area.

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