

# Ailanthus altissima

TREE OF HEAVEN

**ENGLISH NAMES** Tree of Heaven, Tree-of-heaven, Chinese Sumac

**SCIENTIFIC NAME** *Ailanthus altissima*

**FAMILY** Simaroubaceae (Quassia Family)



Photo Credit: © ADOLF CESKA

Tree of Heaven is a fast-growing, liberally self-seeding and suckering deciduous tree.

## RANGE/KNOWN DISTRIBUTION

Native to China, Tree of Heaven was introduced to North America in 1784. Tolerant of pollution, it became a popular street tree in the 19th century. It is now found across much of the northern hemisphere in urban, rural, and natural areas across most of the United States, in Ontario, Quebec, and BC where it is so far restricted to southeastern Vancouver Island, the Fraser Valley, and the Okanagan Valley.

## IMPACTS ON GARRY OAK AND ASSOCIATED ECOSYSTEMS

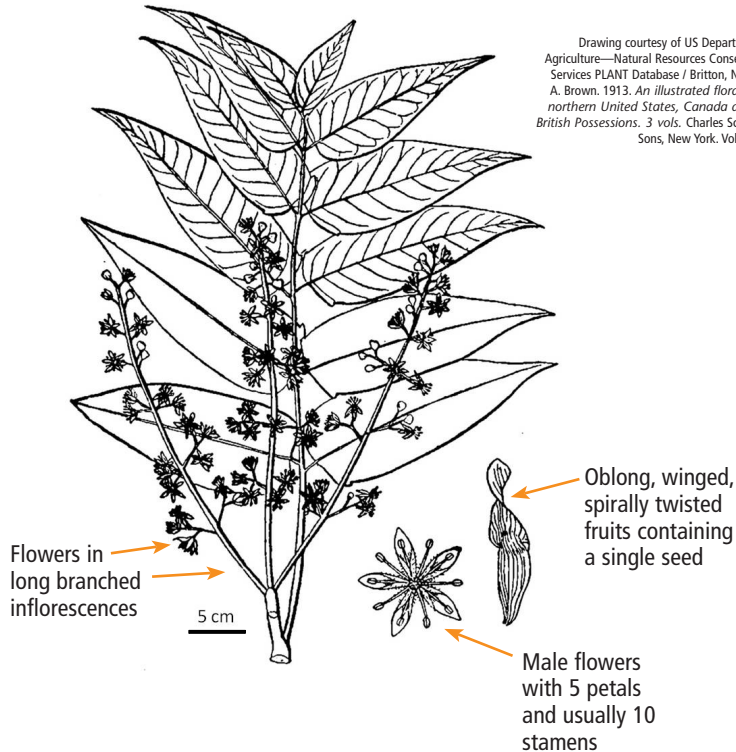
Tree of Heaven is highly invasive and can establish numerous fast-growing individuals, from both suckers and seed, that can exclude and out-compete native plants. More important, it produces a strong phytotoxin that acts as a herbicide on nearby plants of other species but not on its own offspring.

## FIELD DESCRIPTION

A rapidly growing, short to medium-sized tree up to 25 m tall that can form large clonal colonies through suckering. Leaves are large, 30–100 cm long, pinnately compound (like a feather), with 10–40 leaflets arranged on either side of the leaf stem plus a terminal leaf. Leaflets are 5–15 cm long, pointed at the tip, and have 1–3 large glandular teeth near the base. Flowers are small and yellow-green, in upright branching inflorescences 15–30 cm long. Fruits are pink, oblong, spirally twisted, and winged (samaras), containing a single seed and hanging in clusters 2.5–4 cm long. Young shoots are pithy, stout, and covered with velvety yellow to red-brown hairs, becoming smooth (glabrous) with age. Lower branches on larger trees tend to droop. Bark is light brown-grey and smooth, with prominent lens-shaped pores when younger, resembling cantaloupe skin when older. Flowers produce a disagreeable odour, as do the other plant parts when crushed. The coarse teeth at each leaflet's base distinguish Tree of Heaven from the similar-looking and odourless Staghorn Sumac (*Rhus typhina*), whose fuzzy red fruits noticeably persist through winter.

INVASIVE SPECIES IN GARRY OAK AND ASSOCIATED ECOSYSTEMS IN BRITISH COLUMBIA

## AILANTHUS ALTISSIMA



### LIFE HISTORY

Tree of Heaven reproduces sexually and asexually, from seeds and suckers. Although some perfect (functional male and female parts) flowers occur, Tree of Heaven is mostly dioecious (separate male and female plants). This tree blooms in late spring. Male flowers are more conspicuous than female flowers and exude a strong odour that attracts insects. Female flowers produce seeds in winged fruits in summer. Seeds ripen in late summer and are dispersed by wind throughout the winter. Seedlings can establish a long tap root in less than three months, and flowering can occur as soon as six weeks after germination. Established trees also reproduce vegetatively by vigorous suckering from roots and stumps.

### HABITAT

Tree of Heaven is drought resistant and does well in poor to average, dry to medium soils. It does best in full sun to part shade but can tolerate full shade. It will grow almost anywhere in urban settings, including sidewalks and paved areas. Away from urban areas it grows along roadsides, fencerows, woodland edges, and forest openings. Seedlings

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emerge by the hundreds in tilled fields and establish as persistent thickets in rocky uncultivated areas.

### MANAGEMENT

**Develop a long-term, realistic program for invasive species removal before undertaking any work. Before taking action, obtain expert advice. Please refer to the introductory section of this manual.**

**PHYSICAL CONTROL:** Seedlings develop a significant taproot within three months of germination and become very difficult to remove, so hand-pull all seedlings as soon as they are large enough to grasp, ideally when soil is loose and moist. The entire root must be removed since broken fragments will re-sprout. Ensure all cut material is disposed of in a way that precludes re-sprouting from plant fragments. Immediately mulch the area with oak leaf mulch (or mixed broadleaf mulch if oak leaf mulch is not available) until re-planted with suitable native species. Continue mulching until Tree of Heaven seedlings no longer appear. Suckers arising from the roots look similar to the seedlings, but are connected to a lateral root which is nearly impossible to remove without extensive digging. Digging is suitable only for very small infestations where other methods are not practical. Repeat cutting is not recommended. Rather than killing Tree of Heaven, repeat cutting stimulates shoot development and increases stand density.

**BIOLOGICAL CONTROL:** Several fungal pathogens are being investigated as potential controls for Tree of Heaven but none are currently available.

**CHEMICAL CONTROL:** *Herbicides should only be used under expert advice and with extreme caution in Garry Oak ecosystems.* Bark basal or cut and paint applications of the systemic herbicides containing triclopyr or glyphosate have been demonstrated as effective in killing Tree of Heaven and preventing re-sprouting. Stem injection of herbicide can be effective on young shoots. Foliar spray can be effective on large patches of mature trees.

**OTHER TECHNIQUES:** Girdling, or cutting away the bark and cambial tissues in a strip entirely around the trunk, may kill the canopy but will also stimulate vigorous suckering from the roots, root crown, and main trunk. Prescribed burning stimulates the same response and may even result in increased abundance.

**PREVENTATIVE MEASURES:** Monitor natural areas within 2 km of known locations of Tree of Heaven, giving special attention to river corridors. Both fruits and stem fragments can survive for many days submerged in and transported by water, and can be dispersed at regional

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scales via river corridors. Work with municipal land managers and land owners to encourage replacing Tree of Heaven with suitable non-invasive species.

**PERSISTENCE:** Tree of Heaven is highly persistent—one tree can produce 325,000 seeds per year and seeds have a high germination rate. Trees live for up to 100 years.

**GENERAL COMMENTS:** Tree of Heaven was introduced to the United States as a specimen tree and to provide forage for the silk-producing *Samia cynthia* (Drury) caterpillar.

### SELECT REFERENCES

Klinkenberg, B. (Ed.). 2010. *Ailanthus altissima* (P. Mill.) Swingle. E-Flora BC: Electronic Atlas of the Plants of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver.

Meloche, C., and S.D. Murphy. 2006. Managing Tree-of-Heaven (*Ailanthus altissima*) in Parks and Protected Areas: A Case Study of Rondeau Provincial Park (Ontario, Canada). Vol. 37, No. 6, pp. 764-772.

Plant Conservation Alliance's Alien Plant Working Group: LEAST WANTED: Tree of Heaven, *Ailanthus altissima* (Mill.) Swingle. 5 pp. [www.nps.gov/plants/alien/fact/aial1.htm](http://www.nps.gov/plants/alien/fact/aial1.htm).

A bibliography of literature specific to Tree of Heaven is available at [www.goert.ca/invasive](http://www.goert.ca/invasive).

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For more information contact the Garry Oak Ecosystems Recovery Team, or see the website at [www.goert.ca](http://www.goert.ca)