



Southeast Exotic Pest Plant Council Invasive Plant Manual

Common Name: Tree-of-Heaven

Scientific Name: *Ailanthus altissima* (Mill.) Swingle

Ailanthus, also known as tree-of-heaven or Chinese sumac, is a persistent and aggressive weed throughout much of Europe and North America. It belongs to the Simaroubaceae (Quassia) family, which is primarily tropical or subtropical. *Ailanthus* grows quickly and can reach a height of 2.5 m (8 ft) in its first year.

Height: *Ailanthus* can grow rapidly to 25-30 m (80-100 ft).

Leaves: Deciduous leaves are odd-pinnately compound with 11-41 leaflets. Shape is lanceolate, acuminate and entire except for 1-5 basal teeth, each leaflet with a prominent dark green gland on the underside near the apex. Both surfaces have minute hairs and glands. Leaflets are each 7.5-12.5 cm (3-5 in) long and 2.5-5.0 cm (1-2 in) wide. Crushed foliage has an acrid odor. Leaf scars are large and triangular with numerous bundle scars.

Twigs: Light brown twigs are very stout and covered with fine hairs when young. Pith is continuous and yellowish in color. Buds are relatively small and solitary. Terminal buds are absent.

Bark: The smooth, striped, gray-brown or light brown bark cracks with age and exhibits light-colored grooves.

Flowers: Male and female flowers are 0.5 cm (0.25 in) long and form large, light green terminal panicles. They are radially symmetrical with 5 or 6 petals. The trees may be polygamous, but most individuals are unisexual. Male flowers have a foul scent. Each tree may produce up to several hundred inflorescences a year. Blooms late May through early June.

Fruit: Fruit is a 3-8 cm (1.0-1.5 in) long schizocarp with 2-5 samaroid mericarps. Each fruit contains a single seed. Seeds mature in late summer or early fall and form dense, showy pink clusters that persist through the winter. Each cluster may contain hundreds of seeds.

Life History

Ailanthus reproduces from both seed and root sprouts.



Photo by Jil M. Swearingen

Seeds are easily windblown and a high percentage are viable. True seedlings are smaller and thinner-stemmed than root sprouts and have trifoliate leaves. Sprouts will have a cluster of leaves with variable numbers of leaflets. When pulled from the ground, seedlings will reveal thin, branching roots while sprouts will be firmly connected to a thick, rope-like root. Sprouts may emerge up to 15 m (50 ft) from the nearest existing stem. Most stems begin to reproduce at 10-20 years, though two-year old sprouts can produce fruit, and first-year seedlings have been observed flowering. *Ailanthus* is intolerant of shade; in natural stands reproduction is primarily by sprouting. The trees are typically short-lived (30-50 years), though some have survived for over 150 years.



Photo by Chuck Bargeron



Photo by Chuck Bargeron

Origin and Distribution

Ailanthus, native to China, was introduced to Europe and then to the United States in the late eighteenth century. An early Chinese saying refers to spoiled children as "good for nothing *ailanthus* sprouts." It was, nevertheless, widely planted in Europe and North America until recently. Botanists in the late 1800s noted that it was wide-spread and naturalized in Tennessee.



Photo by Paul Wray

Similar Species

Ailanthus may be confused with other trees having compound leaves and many leaflets; particularly black walnut (*Juglans nigra* L.), butternut (*Juglans cinerea* L.), and some species of sumac (*Rhus* spp.). The leaf margins of these trees have small teeth (except for winged sumac), while those of *ailanthus* are smooth. The gland-tipped leaflet lobes are unique to *ailanthus*, as is the foul odor produced by crushed foliage and scraped bark. In winter *ailanthus* may be distinguished by the stout twigs, large leaf scars with numerous bundle scars, and false end buds.

Habitat

Ailanthus is adapted to a wide variety of soil conditions. It tolerates drought and rocky conditions to the extent of growing out of pavement cracks. The tree is common in urban areas and disturbed sites throughout its range, and it is a pioneer in succession with limited ability to compete in a closed-canopy forest. It can, however, take advantage of forests defoliated by insects (e.g., gypsy moth) or impacted by slides, windstorms, or other natural disasters. *Ailanthus* forms dense, clonal thickets that displace native species. A few trees along a fencerow or forest edge can rapidly invade adjacent meadows. In addition to its prolific vegetative reproduction, *ailanthus* has allelopathic effects on many other tree species and may consequently inhibit succession.

Management Recommendations

Mechanical Controls

Cutting: Cut trees at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because *ailanthus* spreads by suckering, resprouts are common after treatment. Cutting is an initial control measure, and success will require either an

herbicidal control or repeated cutting for resprouts.

Girdling: Use this method on large trees where the use of herbicides is not practical. Using a hand axe, make a cut through the bark encircling the base of the tree, approximately 15 cm (6 in) above the ground. Be sure that the cut goes well into the cambium layer. This method will kill the top of the tree but resprouts are common, and may require follow-up treatments for several years until roots are exhausted.

Hand Pulling: *Ailanthus* is effectively controlled by manual removal of young seedlings. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may resprout.

Herbicidal Controls

Foliar Spray Method: This method should be considered for large thickets of *ailanthus* seedlings where risk to non-target species is minimal. Air temperature should be above 65 °F to ensure absorption of herbicides.

Glyphosate: Apply a 2% solution of glyphosate and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species. Glyphosate is a non-selective systemic herbicide that may kill non-target partially-sprayed plants.

Triclopyr: Apply a 2% solution of triclopyr and water plus a 0.5% non-ionic thoroughly wetting all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species. Triclopyr is a selective herbicide for broadleaf species. In areas where desirable grasses are growing under or around *ailanthus*, triclopyr can be used without non-target damage.

Cut Stump Method: This control method should be considered when treating large individual trees or where the presence of desirable species preclude foliar application. Stump treatments can be used as long as the ground is not frozen.

Glyphosate: Horizontally cut stems at or near ground level. Immediately apply a 50% solution of glyphosate and water to the cut stump making sure to cover the outer 20% of the stump.

Triclopyr: Horizontally cut stems at or near ground level. Immediately apply a 50% solution of triclopyr and water to the cut stump making sure to cover the outer 20% of the stump.

Basal Bark Method: This method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 25% triclopyr and 75% horticultural oil to the basal parts of the tree to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

Hack and Squirt Method: Using a hand axe, make cuts at 6.5 cm (3 in) intervals around the trunk of the tree between 15-45 cm (6-18 in) above the ground. Be sure that each cut goes well into or below the cambium layer. Immediately treat the cut with a 50% glyphosate or triclopyr herbicide solution.

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