

TREE OF HEAVEN

Ailanthus altissima

Life History/ Identification:

The tree of Heaven is a deciduous tree that can grow up to 90 feet tall. It has a broad, spreading crown, pinnately compound leaflets, and gray bark. The leaflets resemble sumac leaves that have from one to four glands on the undersides of each leaflet, and have 11 to 25 leaflets per leaf. The leaves are large, from one to four feet in length. The leaf scars are distinctive, having a shape that some people describe as a “monkey face”. The tree usually forms a single trunk with branches forming a canopy that has been described as umbrella-like. Flowers and pollen are borne on separate plants. Large amounts of offensive smelling pollen are produced in the spring. The flowers form between April and July and appear as small, greenish flowers near the ends of the branches. Winged seeds form after flowering. The seeds are red and persist on the trees through out the year. The tree of Heaven can reproduce from seeds or from root sprouts that form on the extensive root system. New stems can arise from the root sprouts as far away as 50 feet from the nearest stem. The tree can form an extensive clonal population from root sprouts.

Northern Arizona Locations:

The tree of Heaven has been used as an ornamental in certain parts of Northern Arizona including the Sedona area and West Fork of Oak Creek. A good example of this species is a large tree that grows on the lawn of the Sedona Ranger Station. The tree grows in many drainage systems throughout the Verde Valley.

Origin and Impacts:

The Tree of Heaven is a native of China and was accidentally introduced into France by French priest Pierre d’Incarville, who was an amateur botanist and industrial spy. D’Incarville thought he was obtaining the seeds of *Rhus verniciflua*, a source of lacquer used in the production of polished woodenware. The tree is a hardy plant, which is tolerant of urban life and grows rapidly. The species was imported into the Eastern United States in 1784 as use as an ornamental. However, Chinese immigrants may have introduced it into the Western United States for medicinal purposes.

The tree of Heaven is an invasive exotic. It has been described as a pernicious weed by several authors, often out-competing other plants. In cities it is able to grow through concrete. It competes locally with such species as box elder (*Acer negundo*) and other native trees in the West Fork area. Typical habitats for this species are disturbed and semi-natural areas such as roadsides and in riparian zones. Root sprouts can form in response to control efforts including cutting. The copious amounts of pollen produced may cause suffering in people who have “hay fever” or other allergies.

Control:

The tree of Heaven is a hardy plant. Treatment of this species will require persistence to eradicate the tree from wild settings. **Prevention** of more introductions of this into native ecosystems will help control it. The tree of Heaven is no longer sold in nurseries due to its undesirable attributes. If commercial sources are still available for this plant, the suppliers need to be educated on the invasive nature of this species. Planting this species in wild land settings or on roadsides should be strongly discouraged. Information on the invasive nature of this species should be shared with local citizens. With the species apparently widespread local citizens may be digging up trees from one place and transporting them to another. This practice should be discouraged. It could add to the dispersal of the species throughout the area. The population of tree of Heaven that exists in the West Fork area is present due to former human habitation of the area. Other populations in the Verde Valley area probably resulted from escape from cultivation to wildland areas.

Cultural Control:

Plant Competition may help control the plant in certain forest types. Tree of Heaven seedlings are intolerant of shade and is unable to reproduce in shady environments. Over time, without recruitment of new plants to the population a population of tree of Heaven in this habitat could possibly die out. While

this is not a control method that could be actively initiated with the hope of results in the near future, it may have some application. If a tree of Heaven group is discovered in dense vegetation, the local land manager should consider leaving the dense stand intact allowing plant competition to take place. The tree of Heaven might persist for many years but might not actively spread from root sprouts. The tree of Heaven does not tolerate extreme cold and prolonged snow conditions. These natural control factors will help limit infestations of this species to the lower elevations of the Coconino, Kaibab and Prescott National Forest. The tree of Heaven also does not tolerate prolonged flooding.

Mechanical Control:

Mechanical control of this species is labor intensive. Some past control efforts using only mechanical controls have failed. This failure is due to the ability of the tree to form copious numbers of root sprouts. Cutting the stem of an established tree only results in formation of many more stems. Repeated and persistent efforts would be necessary to eradicate this species by cutting. Individual trees have a relatively short life span for a woody species. However, clones form from root sprouts, which can persist for many years. Digging out young plants is somewhat successful in some places. The plants should be dug up before extensive root systems form and care should be taken to remove all of the roots from the soil. Digging in well-established populations will only stimulate more root sprouts. No information was found in the literature on the effects of fire on the tree of Heaven. However, the infestation in West Fork is on the site of the Mayhew Lodge. The lodge was destroyed by fire in 1980 and the tree of Heaven plants on the site are alive and doing well.

Chemical Control: *Noted here are chemical control techniques in use in other areas. Always check with weed specialists or chemical suppliers to ensure correct dosage and application. Mention of these products does not imply endorsement by the Northern Arizona Weed Council, San Francisco Peaks Weed Management Area, the USDA Forest Service, nor the Nature Conservancy.*

Foliar application of herbicide will help control the tree of Heaven. Glyphosphate can be used but it is not selective and will affect all plants that it contacts. Triclopyr is selective for broadleaf and woody plants but will not affect grasses. Both of these herbicides are systemic. They are absorbed by the plant and translocated to all parts of the plant including the roots. Other herbicides that have proven effective for foliar treatment of the tree of Heaven include dicamba, imazapyr and metsulfuron methyl. The basal bark method is generally used for tree 6 inches or less in diameter. The timing of these treatments is important. Late summer or fall treatment facilitates translocation of the herbicide to the root system. The herbicide is applied completely around the trunk. Oil-based triclopyr is used. Imazapyr is also effective. Herbicide injection or "hack and squirt" can control the tree of Heaven. In this method an ax or other tool is used to make cuts in the bark into the sapwood (cambium) of the tree. Then herbicide such as triclopyr or dicamba is squirted into the cuts. This method is best done in the summer. Care should be taken not to completely girdle the tree. This sends the tree into "emergency response", causing it to begin forming root sprouts.

Biological Control:

There are currently no approved biological control agents for the tree of Heaven. The Cynthia Moth (*Samia cynthia*) was introduced into the United States in the 1860's with the intent of starting a silk industry. The industry never thrived and the populations of the moth dwindled. The tree of Heaven is the preferred host of this insect but it can also feed on wild cherry and plum. Promotion of this insect for control would not be appropriate. There are several native species of *Prunus* in the Oak Creek Canyon and Verde Valley areas, as well as orchards in the area, which could be subject to attack.

Integrated Control:

The most effective control method for the tree of Heaven is cutting combined with herbicide. In this treatment the stems of the tree of Heaven are cut down and the stumps are painted with herbicide. This treatment should be done in the fall or after blooming. This timing takes advantage of translocation, facilitating the transfer of the herbicide to the roots. New sprouts are then treated with direct foliar herbicide application.

Moser, L; D. Crisp. San Francisco Peaks Weed Management Area fact sheet on *Ailanthus altissima*. Coconino National Forest.