

Maclura pomifera

Osage orange

Moraceae

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OVERVIEW

Maclura pomifera (osage orange) is a thorny, dioecious tree, native to a narrow band near Texas and Arkansas, and widely planted throughout North America and southern Canada for windbreaks and fence posts. *Maclura pomifera* has become naturalized in areas where it has been planted. *Maclura pomifera* is considered a pest plant in Italy and is being monitored for invasive potential in Spain where it is cultivated (Dana et al. 2001). Recently, a single hedge of *Maclura pomifera* was discovered in Ha'iku, Maui. In addition, Skolmen (1960) reports that *Maclura pomifera* was used as a forestry tree and was planted on Moloka'i, Hawai'i, and Maui. The status of these forestry plantings is not known and needs further investigation. The hedge in Ha'iku appears to show no sign of regeneration yet and only un-ripened female fruits have been observed. With an invasive history and limited distribution on Maui, this species is a good candidate for eradication before it becomes naturalized. It should also be prevented from further use in plantings through education and, or by adding it to the state noxious weed list.

TAXONOMY

Family: Moraceae (Mulberry family) (Wagner et al. 1999).

Latin name: *Maclura pomifera* (Raf.) Schneid. (PLANTS 2003).

Synonyms: *Ioxylon pomiferum* Raf., *Toxylon pomiferum* Raf. ex Sarg (PLANTS 2003).

Common names: Osage orange (PLANTS 2003), hedge apple, bois d'arc (Carey 1994).

Taxonomic notes: The genus, *Maclura*, is comprised of a single dioecious species, *Maclura pomifera*.

Nomenclature: The genus, *Maclura*, is named in honor of William Maclure, American geologist. The species name, *pomifera*, refers to bearing pomes or apples, for the fruit.

Related species in Hawai'i: None known.

DESCRIPTION

Small deciduous tree that averages 30 ft (9 m) in height. Though, in some sites, trees are may grow as tall as 21 m (70 ft) (Burns and Honkala 1990). It has a short trunk and rounded crown. Shade-killed lower branches remain on the tree for years, forming a dense thicket. Branches growing in full sun have sharp, stout thorns 0.5 to 1 in (1.3-2.5 cm) long. Osage orange has a large, round multiple fruit composed of many fleshy calyces, each containing one seed. Osage orange generally has a well-developed taproot; a tree in Oklahoma had roots more than 27 ft (8.2 m) deep. On shallow soils, roots spread laterally. (Burton 1990, Godfrey 1988, Wasser 1982).

"Osage orange is dioecious. The simple, green, four-part flowers appear soon after the leaves on the same spurs. Male flowers are long peduncled axillary racemes 2.5 to 3.8 cm (1 to 1.5 in) long on the terminal leaf spur of the previous season; female flowers are in dense globose heads, axillary to the leaves, about 2.5 cm (1 in) in diameter. The female flowers in ripening becomes very fleshy, forming a large multiple fruit or syncarp composed of 1-seeded drupelets. The ripe fruit, 7.6 to 15 cm (3-6 in) in diameter, yellowish-green, resembles an orange and exudes a bitter milky juice when bruised." (Bailey 1935, Burns and Honkala 1990).

BIOLOGY & ECOLOGY

Cultivation: *Maclura pomifera* has been planted in North America in greater numbers than any other tree species (Burns and Honkala 1990). Known for its hardiness, tolerance to drought, extremely hard wood, resistance to termites, and ability to grow in most types of soils, *Maclura pomifera* were valued and widely planted as windbreaks, then harvested for fence posts (Burns and Honkala 1990). *Maclura pomifera* is said to have led to the invention of barbed wire and was used for the posts when most of the west was fenced for cattle ranching. Native American Indians used the wood for making hunting bows. It has also been used in furniture making, for erosion control, as a landscape plant, and in strip mine reclamation (Burns and Honkala 1990).

Invasiveness: *Maclura pomifera* readily escapes from cultivation and invades disturbed areas (Burns and Honkala 1990). Abundant seeds are produced and seedlings readily germinate near parent plants. Seeds are also dispersed further by livestock, mammals, and birds that eat the fruit. In the United States, thickets occur in degraded pastures, along fences, ditches, ravines, and abandoned farms (Burns and Honkala 1990). Due to its invasiveness, *Maclura pomifera* is prohibited from planting in the village of Elburn, Illinois (Village of Elburn website 2003). *Maclura pomifera* was also recently detected in Spain where it is cultivated and is not yet known to be invasive, but is being monitored because of its invasiveness elsewhere in Europe (Italy) (Dana et al. 2003).

Pollination: *Maclura pomifera* is wind pollinated (Burns and Honkala 1990).

Propagation: When both sexes are present, *Maclura pomifera* propagates by seeds. Female plants that occur without male plants produce seedless fruits (Burns and Honkala 1990). Seeds have a slight dormancy that may be overcome by a 48 hour soak in water (Burns and Honkala 1990). Thornless male clones are often propagated by cuttings or grafts. Plants begin producing viable seed by about the 10th year, reach optimum seed bearing by years 25 through 75, and may live up to 100 years (USDA 1974).

Dispersal: *Maclura pomifera* seeds are dispersed by livestock, mammals, and birds that feed on the fruits (Burns and Honkala 1990). Seeds are also dispersed by gravity and water (Carey 1994).

Pests and diseases: Though considered extremely hardy and less susceptible to damage than any other trees planted in the Prairie States Forestry programs, a few pests are known to attack *Maclura pomifera*. It is susceptible to cotton root rot and at least four

stem borers including the mulberry borers (*Doraschema wildii* and *D. alternatum*), the painted hickory borer (*Meacyllene caryae*), and the red-shouldered hickory borer (*Xylobiops basilaris*) (Burns and Honkala 1990). Several scale insects attack *Maclura pomifera* including the European fruit lecanium (*Parthenolecanium cornii*), the walnut scale (*Quadraspidiotus juglansregiae*), the cottony maple scale (*Pulvinaria innumerabilis*), the terrapin scale (*Mesolecanium nigrofasciatum*), and the San Jose scale (*Quadraspidiotus perniciosus*) (Burns and Honkala 1990). Mice have been known to girdle younger trees in Illinois (Burns and Honkala 1990).

DISTRIBUTION

Native range: According to Burns and Honkala (1990), "The natural range of osage orange is in the Red River drainage of Oklahoma, Texas, and Arkansas; and in the Blackland Prairies, Post Oak Savannas, and Chisos Mountains of Texas." According to some authors, the original range included most of eastern Oklahoma, portions of Missouri, and perhaps northwestern Louisiana. In these areas, *Maclura pomifera* occurs in bottom lands that are often inundated with water, mixed with other hardwoods, and interspersed with prairie (Burns and Honkala 1990). In its native range, *Maclura pomifera* occurs in areas that receive an average annual rainfall of 1,020-1,140 mm (40-45 in) and average temperatures that range from 27 C (80 F) in July to 6-7 C (43-45 F) in January, with an extreme of -23 C (-10 F) (Burns and Honkala 1990).

Global distribution: *Maclura pomifera* has been planted in all the 48 conterminous States as well as in southeastern Canada (Burns and Honkala 1990). Dana et al. (2001) include *Maclura pomifera* in a list of "aliens which have showed to be highly invasive in other European Countries and which may represent a potential threat for Spanish ecosystems". It was detected in Spain but is not yet invasive there yet, though it is considered invasive in Italy.

State of Hawai'i distribution: *Maclura pomifera* was recently collected from a cultivated hedge in the Ha'iku area of Maui. This was thought to be the only known occurrence of this species in the state, until recently when it was found to be listed by Skolmen (1960) as planted in reforestation efforts on Moloka'i, Hawai'i, and Maui. On Moloka'i, 217 trees were planted in 1952. On Hawai'i, 12 trees were planted in the Ola'a area in 1922. On Maui, 8 trees were planted in the Waihou Springs area in 1931. The current status of these plantings is not known and needs further investigation.

Island of Maui distribution: On Maui, a single cultivated hedge is currently known from a planting in Ha'iku. The area is located at approximately 350 ft (107 m) elevation in a moist lowland disturbed residential setting. The area receives approximately 40-60 in (102-152 cm) average rainfall annually (Juvik and Juvik 1998). The *Maclura pomifera* hedge fronts a residential property and is adjacent to the road. The hedge is extremely thorny and could be comprised of female plants as only immature fruits have been observed to date. No regeneration has been observed yet. *Maclura pomifera* displays aggressive vegetative growth and occasionally road crews have to cut the plant back from the roadway. The 8 plants listed in Skolmen (1960) that were planted in 1931 in Waihou Springs needs further investigation. Former state forester, Robert Hobdy, does not know

of these trees in the area and it is uncertain if they are present or not. If found, these could also be controlled to prevent future spread.

CONTROL METHODS

Physical control: The plants may be cut to the ground and the roots dug up. Care must be taken when handling the plant because of its sharp thorns.

Chemical control: The plants probably can be cut to ground level with a proper application of herbicide. Plants will re-sprout if cut without herbicide. Hamel (1981) reports effective control using triclopyr or picloram applied with a chainsaw girdling treatment.

Biological control: None known.

Cultural control: The public could be informed of the invasive tendencies of *Maclura pomifera* and asked not to plant it.

Noxious weed acts: *Maclura pomifera* is prohibited from planting in the town of Elburn, Illinois (Village of Elburn website 2003).

MANAGEMENT RECOMMENDATIONS

Maclura pomifera is an extremely thorny dioecious tree native to a narrow area near Texas and Arkansas. It has been widely planted and naturalized throughout North America and is used mainly for fence posts and wind breaks. *Maclura pomifera* is cultivated and naturalized in Italy and was recently detected in Spain where it is now being monitored for spread. In Hawai'i, a single cultivated hedge of *Maclura pomifera* was recently detected in Ha'iku, Maui. It is also listed as planted in several forest reserves on the islands of Moloka'i, Hawai'i, and Maui (Skolmen 1960). For Maui, only 8 plants were listed as planted in the Waihou Springs area in 1931. The current status of this planting is not known and needs further investigation. Control of all known *Maclura pomifera* plants on Maui now may help prevent its eventual naturalization and spread in the future. Measures to prevent this species from being further planted are also needed, through education and, or noxious weed laws. Searches for new locations on Maui and other Hawaiian Islands is also recommended.

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