



## VEGETATION MANAGEMENT GUIDELINE

Osage orange (*Maclura pomifera* (Raf.) Schneider)

### SPECIES CHARACTER

#### DESCRIPTION

Osage orange is a medium-sized tree with milky sap that will grow to 40 feet (12 meters) tall. It has a short trunk and a rounded much-branched crown. Shade-killed lower limbs remain on the tree for several years forming a dense thicket. Bark is light gray-brown, tinged with orange and separates into shaggy strips as the tree matures. Twigs are orange-brown with a zigzag shape and may have sharp, stout axillary spines 0.5 to 1 inch (1.3 to 2.5 cm) long. These spines may be infrequent or absent on mature, slow-growing trees, but will return on sprouts from such trees.

Leaves are alternate, entire, shiny, ovate or ovate-lanceolate, and long pointed at the tip. Staminate (pollen-producing) and pistillate (fruit-producing) flowers are born on separate plants and appear from April through June. Staminate flowers are arranged in loose, globose to oblong axillary heads on the terminal leaf spur from the previous season. The pistillate flowers are crowded into dense, spherical heads.

The fruit is large, spherical, greenish-yellow, and up to 6 inches (15 cm) in diameter. The fruit can weigh up to 2 pounds (~ 1 kg), is fleshy when mature and contains many seeds. Falling fruits are hazardous during abscission in late September to early November. Workers should wear hard hats around fruit-producing trees. The fruit exudes a bitter, milky juice that may cause skin irritation. Osage orange should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate manuals or keys.

#### SIMILAR SPECIES

Red mulberry (*Morus rubra*) and white mulberry (*Morus alba*) have a growth form, wood, and bark that are similar to osage orange, but they lack stout spines. Mulberry leaves are simple, mostly ovate, short to abruptly pointed at the tip, unlobed or 2- to 3-lobed. Red mulberry has hairs on the lower surface of the leaf and has 1½ inch (3.5 cm) long fruits that are red when immature and purple or black when ripe. White mulberry leaves are smooth on the lower surface, except for a few hairs on the veins and have 1½ inch (3.5 cm) long fruits that are white when ripe.

#### DISTRIBUTION

Osage orange is native to the south-central United States where it occurs naturally in Arkansas, Texas, and Oklahoma. It has been widely planted throughout the continental United States and southern Canada. It was introduced into Illinois by Professor Johnathan Turner in 1847 and now



occurs in every county. It has been planted for shelterbelts, erosion control, as a living fence for pastured areas, a soil stabilizer in mine reclamation projects and, to a lesser extent, for wildlife cover. Thornless varieties have been developed and marketed as ornamentals.

#### HABITAT

Osage orange typically occurs in open sunny areas, is very drought tolerant and can grow in a wide range of soil types and soil moisture conditions. However, it has a lower soil pH limit of 4.5. It grows best in well-drained soils. It is most frequently found in hedgerows or pastures, but also occurs in disturbed and floodplain forests. In abandoned pastures, stem density for trees larger than 10 cm dbh can reach 200 stems/ha.

#### LIFE HISTORY

Osage orange is resistant to drought, heat, road salt, and urban air pollution, but is intolerant of dense shade. It generally has a well-developed taproot. A tree excavated in Oklahoma had roots more than 27 feet (8 m) deep. On shallow or compacted soils the roots spread laterally. Lateral root growth can reach a radius of 7 feet (2 m) after 3 years, 14 feet (4 m) after 7 years and 16 feet (5 m) after twenty years. After twenty years of growth in loose soil, lateral roots can be as abundant in the eighth as in the first foot of soil.

Osage orange can reproduce by seed and vegetatively from rootsprouts. Cut stumps will resprout vigorously. The young sprouts and twigs lack spines and are relished by livestock. Early guidelines for managing hedgerows recommended stacking pruned older limbs among the tender sprouts to prevent cattle from grazing on the shoots.

Pistillate trees begin producing abundant fruit about the 10<sup>th</sup> year and produce every year thereafter. Pistillate trees will produce even when staminate trees are not nearby, but such fruits contain no seeds. Fruits and seeds can be dispersed by water. Few animals feed on the fleshy portion of the fruit, but the seeds are consumed by squirrels, rodents, foxes and some birds. Seeds may pass through the digestive system of animals and remain viable. Seeds require exposed mineral soil and full sun for germination.

The wood of Osage orange is yellow or orangish, hard, durable, flexible and resistant to decay, termites and injury from ice, wind and disease. It has little value for saw logs, pulp wood or utility poles, but is used extensively for fence posts and bows. Extracts of the heartwood and roots have actual or potential use in dyemaking, food processing and pesticide manufacturing and contain antifungal and nontoxic antibiotic agents. The fruits contain organic compounds that have been used as insect repellants.

#### EFFECTS UPON NATURAL AREAS

Osage orange is an adventive species that frequently invades prairies, savannas, and forests usually as a result of past disturbance such as grazing.

### CONTROL RECOMMENDATIONS

#### RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

##### Mechanical control

Cutting can provide limited short-term suppression of Osage orange, but repeated cutting will be necessary. Cutting during summer months (June - August) may provide the best results, and two cuttings in one year may be more effective than one. Summer cutting affects the plant when its root resources are low and the possibility of adverse weather during the fall and winter may further harm the plant. Cutting is most feasible with smaller plants.

Girdling may be an effective method for medium to large trees. For girdling, the phloem should be removed without damaging the xylem. The girdles should be checked every several weeks at first to make sure that bark does not develop over the cut area. Girdling can be done with an ax, saw, or chainsaw. Two parallel cuts 3-4 inches apart, cutting through the bark slightly deeper than the cambium, are needed. The bark is knocked off using a blunt object like the head of an ax.

All cutting or girdling practices, done without herbicide treatment, will probably result in the development of vigorous sprouts that may be extremely difficult and hazardous to handle after they develop their axillary spines. The tips of these spines are brittle and may remain embedded when the spines are extracted from puncture wounds. Workers should take extra precautions to protect their eyes, hands, arms, knees and feet when handling these sprouts. A cut-surface treatment with herbicide, as described below, is recommended to minimize sprouting.

### Chemical control

Triclopyr herbicide (trade name Garlon 4 or 3A) is effective as a thin line, basal bark or cut-surface treatment. For thin line treatment, undiluted Garlon 4 can be applied in a thin stream to all sides of the stem 6 inches above the base of the plant. This method works best on trees that are less than 6 inches in diameter and have smooth bark. A narrow band of Garlon 4 encircling the stem is needed for control.

For basal bark treatment, Garlon 4 mixed at the rate of 2.5 gallons of herbicide with 12.5 gallons of mineral oil (16.6) is applied to the basal portion of the tree trunk. Spray basal parts of brush and tree trunks to a height of 12-15 inches (30 - 38 cm) and thoroughly wet lower stems, including root collar area, but not to the point of runoff. Apply any time, including winter, except when snow or water prevent spraying to the ground line. This method works well on trees that are less than 6 inches in diameter and have smooth bark.

Cut-surface treatment with Garlon 3A, a selective, translocated herbicide that will not harm grasses or sedges, effectively controls Osage orange. A diluted solution of Garlon 3A (50% solution in water) or the 16.6% Garlon 4 solution previously described can be sprayed on the cut or wiped on using a sponge applicator. Either a stump or girdle can be used for the cut surface. Girdles can be made rapidly using a chain saw. Application should be as soon as possible, and no later than 2-3 hours after cutting. Cut-surface application is most effective when used during late summer, autumn or winter. Sap flowing from the cut surface may dilute or wash away herbicides applied in the spring.

Use of triclopyr is best done in the dormant season to lessen damage to non-target plants. Great care should be exercised to avoid getting any of the mixtures on the ground near the target plant since some non-target species may be harmed. Avoid using triclopyr if rain is forecast for the following day, otherwise run off will harm non-target species. Herbicides should not be applied when there is snow cover. By law, herbicides only may be applied as per label directions

and by licensed herbicide applicators or operators when working on public properties. Osage orange seems to be very sensitive to triclopyr; therefore, very small amounts can be used, lessening the possible harm to non-target plants.

### Prescribed burning

Periodic prescribed burning will top kill young Osage orange trees or sprouts, but may induce more sprouting. Burning can be used in conjunction with cutting for small plants. Large Osage orange trees may be resistant to fire and need another control method such as girdling or cutting. In prairie communities, prescribed burning can invigorate native grasses that provide additional competition for Osage orange seedlings.

### RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Same as given above for high quality areas.

Additionally, picloram plus fluroxypyr (tradename Surmount) may be applied as a foliar spray to areas of heavy infestation in disturbed areas. For best results, a solution of 1.25 ounces of Surmount plus 0.5 ounce of non-ionic surfactant is added to water to make 1 gallon of solution and applied to a 1,000 square foot area. Surmount is effective on broadleaf and woody plants and will not harm established grasses; however, newly planted grasses are susceptible. It is most effective when leaves are fully expanded and terminal growth has slowed. Application to immature foliage during periods of rapid growth will cause defoliation, but may inhibit translocation of the herbicide. Surmount is a restricted use herbicide that should not be used in residential areas, where the water table or risk of ground water contamination is high, or near standing water.

A 1% solution of Krenite (a formulation of fosamine ammonium), a non-volatile, contact, brush herbicide, can be applied as a foliar spray to leaves during the 2-month period before fall coloration. Krenite should be applied only in July-September. In northern Illinois, Krenite should be applied before September 15 and is most effective when applied in August. Thorough coverage with soft water carrier is required and a nonionic surfactant will improve results. Krenite inhibits bud expansion in the spring and control effects are not seen until the following spring. Slight regrowth may occur the following season but saplings will die during the summer. Follow label recommendations to obtain best results; minimize drift. Care should be taken to avoid contacting non-target species. **Do not spray so heavily that herbicide drips off the target species.** As mentioned earlier, follow-up treatments are usually necessary because of Osage orange's prolific sprouting and rapid growth.

### BIOLOGICAL CONTROL

The only known disease to seriously affect Osage orange is cotton root rot caused by a fungus, *Phymatotrichum omnivorum*, that occurs primarily in Texas, Oklahoma and Arizona. Osage oranges in the northeast have occasionally succumbed to *Verticillium* wilt caused by *Verticillium albo-atrum*.

A macluravirus was reported in the former Yugoslavia in 1973. The virus causes interveinal mosaic, occasional vein-banding and leaf distortion especially in spring and autumn.

However, infected plants exhibited only mild, local symptoms or no symptoms at all. The virus has been transmitted under experimental conditions by the aphid *Myzus persicae* and by grafting. Other susceptible hosts include members of the Amaranth, Chenopod, Convolvulus, fig marigold, pea, and mulberry families. Symptoms observed in these families were similar to those observed in Osage orange.

Other agents or diseases that can damage Osage orange are: mistletoe, *Phoradendron serotinum* and *P. tomentosum*; scale insects, European fruit lecanium (*Parthenolecanium corni*), walnut scale (*Quadraspidiotus juglansregiae*), cottony maple scale (*Pulvinaria innumerabilis*), terrapin scale (*Mesolecanium nigrofasciatum*), and San Jose scale (*Quadraspidiotus perniciosus*); fruit-tree leafrollers (*Archips argyrospilus*); fall webworm (*Hyphantria cunea*); and mites, *Tegolophus spongiosus* and *Tetranychus canadensis*.

The fungi, *Phythium ultimum*, *Rhizoctonia solani* and *Phellinus ribis*, cause damping-off, root rot and attack stemwood exposed in wounds, respectively. *Poria ferruginosa* and *P. punctata* are the only two wood-destroying basidiomycetes reported on Osage orange. They occur only on dead wood, mainly in tropical and subtropical parts of the western hemisphere.

Leafspot diseases can be caused by *Ovularia macluriae*, *Phyllosticta macluriae*, *Sporodesmium macluriae*, *Septoria angustissima*, *Cercospora macluriae*, and *Cerotelium fici*.

Stem borers that feed on Osage orange are the mulberry borer (*Doraschema wildii* and *D. alternatum*), painted hickory borer (*Megacyllene caryae*) and red-shouldered hickory borer (*Xylobiops basilaris*).

With the exception of cotton root rot, most of the aforementioned diseases or agents cause only minor and/or localized damage and are probably not viable control agents at this time.

### FAILED OR INEFFECTIVE PRACTICES

A single cutting or prescribed burn is not an effective control measure for Osage orange and will result in a greater number of stems.

Girdling without herbicide treatment or follow-up cutting of rootsprouts will likely result in a larger number of smaller stems or rootsprouts.

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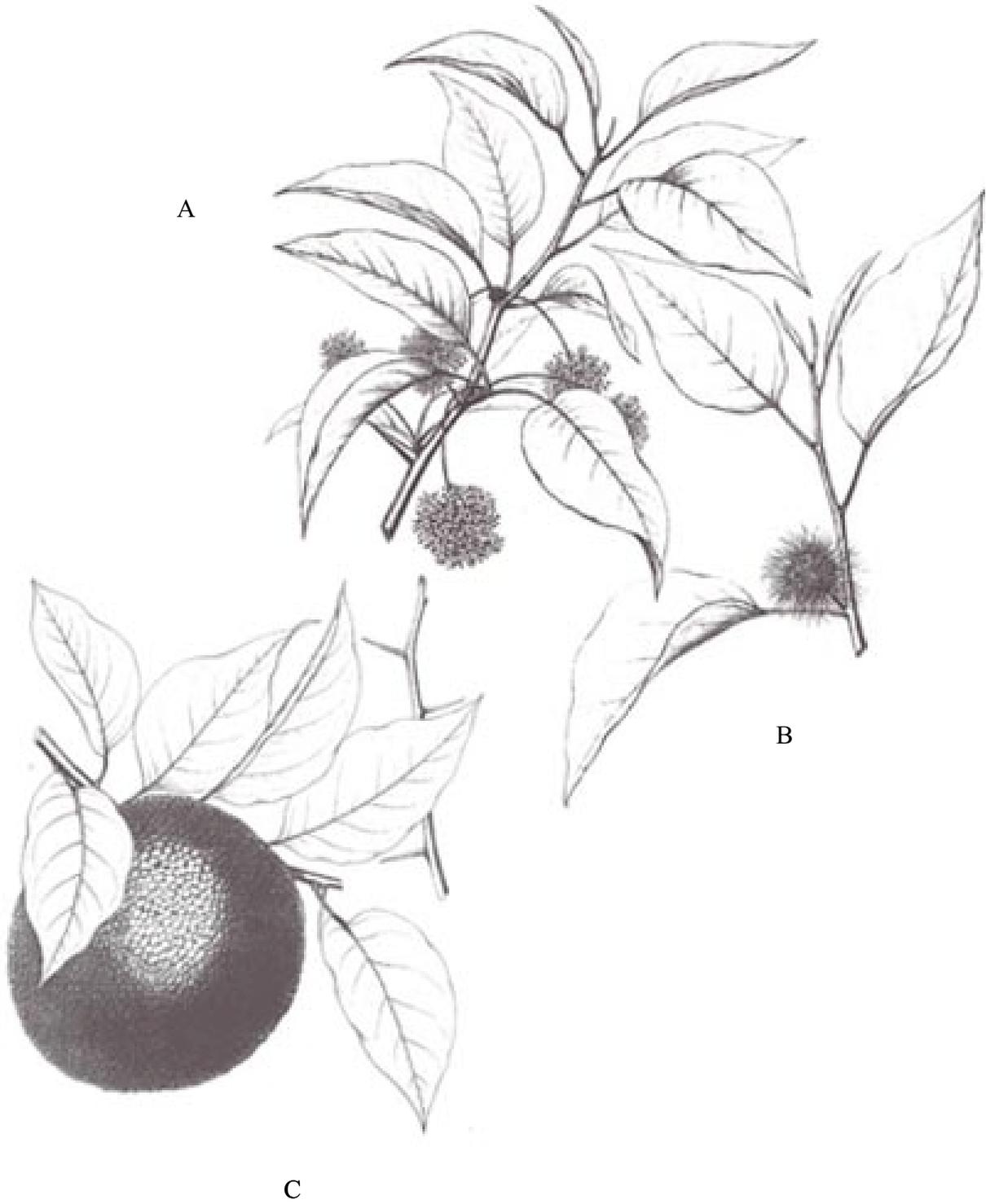
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*Maclura pomifera* (Raf.) Schneider (Osage orange) A - Leaves and pistillate flowers; B - Leaves and staminate flowers; C - Leaves, fruit, twig with spines.