

## Minnesota Noxious Weed Risk Assessment

Developed by the Minnesota Noxious Weed Advisory Committee

### Assessment information

**Common name:** Amur corktree

**Scientific name:** *Phellodendron amurense* Rupr.

Synonyms:

*Phellodendron amurense* var. *sachalinense* F.Schmidt

*Phellodendron japonicum* Maxim.

*Phellodendron lavalleyi* Dode

*Phellodendron insulare* Nakai

*Phellodendron molle* Nakai

*Phellodendron wilsonii* Hayata & Kanehira

*Phellodendron piriforme* E.Wolf

*Phellodendron kodamanum* Makino

*Phellodendron nikkomontanum* Makino

*Phellodendron sachalinense* (F.Schmidt) Sarg. var. *suberosum* H.Hara

**Family name:** Rutaceae

Current reviewer name and organizational affiliation: David Stevenson, Minnesota Landscape Arboretum

Date of current review: August 5, 2021

### Species description

#### Photos



Photo caption: Amur corktree, Minnesota Landscape Arboretum (photo credit: Jan Malyza)



Photo caption: Amur corktree, fruit, foliage and bark (photo credit: unknown)

### Why the plant is being assessed

- The species has been reported to readily spread in several states including Minnesota.
- *Phellodendron amurense* is a prohibited species in Wisconsin and several other states.
- Amur corktree seed is bird disseminated and can spread significant distances.
- Single trees of the species can produce large numbers of seed.

### Identification, biology, and life cycle

- Tree with a broad crown, up to 45 feet in height.
- Twigs are yellowish gray turning brown with age; leaf scars are raised, and horseshoe shaped.
- Leaves are dark green, opposite, odd-pinnate with 5-13 leaflets, and 10-15" long.
- Bark is gray-brown, deeply furrowed and "corky" with a bright yellow inner bark.
- This species is dioecious, borne in 2-3.5" long panicles in late May-early June.
- Fruit is a green berry-like drupe, ½" diameter, with a strong odor when bruised; ripening to black in late fall and persisting into winter.
- Seed germinates easily without any treatment.
- Adapted to a wide range of soil types; prefers well-drained conditions.
- Drought and pollution tolerant.
- Prefers full sun.

### Current distribution

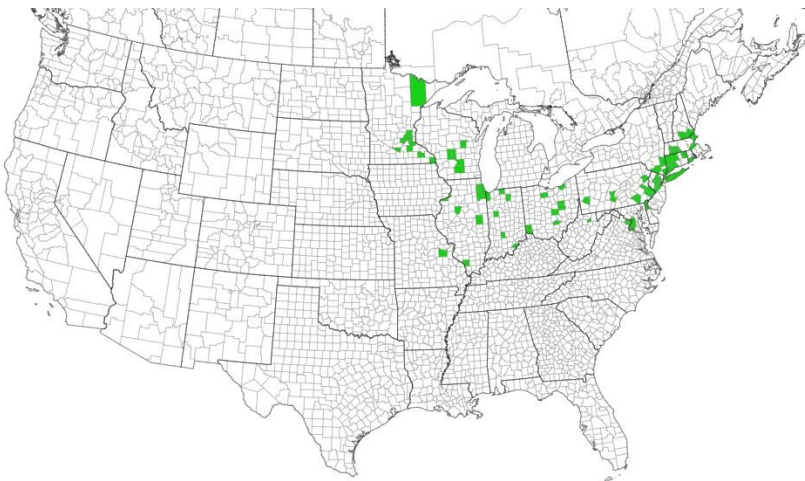


Photo caption: National level map by county from EDDMapS for Amur corktree (accessed 20 July 2021).

*Phellodendron amurense* is reported in the U.S. from New England west to Minnesota and south to St. Louis, MO and southern Illinois.

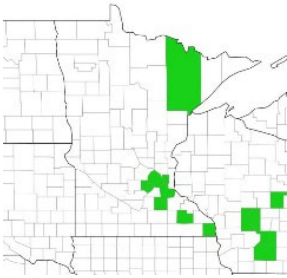


Photo caption: State level map from EDDMapS (accessed 21 January 2020).

Amur corktree has been reported in eight Minnesota counties in [EDDMapS](#) including 79 reported sightings. It should be noted that some EDDMaps reports for Amur corktree in Minnesota are actually planted trees and do not represent escapes of the species.

### Current regulation

*Phellodendron amurense* is not currently regulated in Minnesota. It is a prohibited species in the states of Massachusetts, Indiana and Wisconsin (exempting male cultivars and seedling rootstock in Wisconsin). The species is not currently regulated at the U. S. federal level.

### Risk assessment

#### Box 1:

#### Is the plant species or genotype non-native?

Answer: yes

Outcome: Go to Box 3

Native range is eastern Asia including Northern China, Korea, and Japan (Ma et al. 2006).

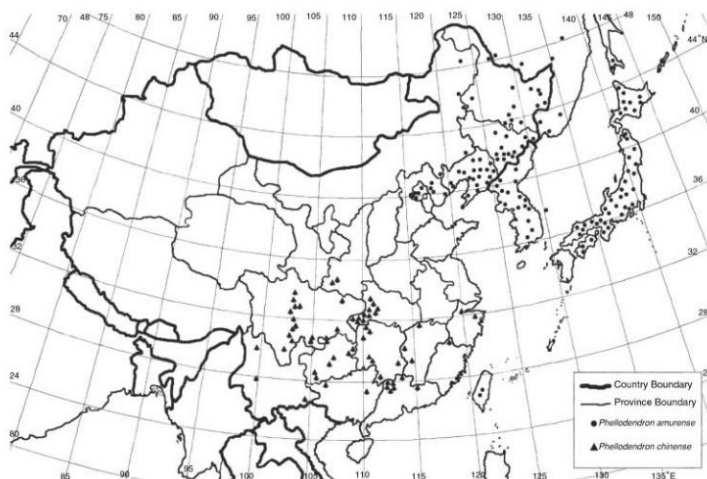


FIG. 5. Native distribution of *Phellodendron* in East Asia.

Image credit: Ma et al. (2006)

---

**Box 2:**

**Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production?**

*Question 2A: Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?*

Outcome: Decision tree does not direct to this question.

*Question 2B: Does the plant cause significant financial losses associated with decreased yields, reduced quality, or increased production costs?*

Outcome: Decision tree does not direct to this question.

---

**Box 3:**

**Is the species, or a related species, documented as being a problem elsewhere?**

Answer: yes

Outcome: Go to Box 6

In 2008-09 a study was done of *Phellodendron amurense* in the urban and suburban woodlands of the New York City Region:

“In 2008 and 2009, surveys were performed at sites where *Phellodendron amurense* was reported to have been found growing adventively. From these sites, five invasions of reproducing populations were identified and investigated further. These five sites, located in Bronx County, New York; Fairfield County, Connecticut; Philadelphia County, Pennsylvania; Queens County, New York; and Tolland County, Connecticut, were then investigated for similarities in their forest composition that may help to explain forest susceptibility to invasion by *P. amurense*. This work reports that *P. amurense* is a much more widespread invader than previous literature suggests, and that the invasion is not limited to any particular forest type.” (Morgan and Borysiewicz 2012)

Regulated as a prohibited species in [Wisconsin](#) except for male cultivars and seedling rootstock.

Regulated as a prohibited invasive terrestrial plant in [Indiana](#).

Regulated as a prohibited species in [Massachusetts](#).

Regulated as a prohibited species in [New York](#).

---

**Box 4:**

**Are the species' life history and growth requirements understood?**

Outcome: Decision tree does not direct to this question.

---

**Box 5:**

**Gather and evaluate further information**

Outcome: Decision tree does not direct to this question.

---

**Box 6:**

**Does the species have the capacity to establish and survive in Minnesota?**

Question 6A: Is the plant, or a close relative, currently established in Minnesota?

Answer: yes

Outcome: Go to Box 7

*Phellodendron amurense* is fully hardy in zones 3 and 4 (Snyder 1980). EDDMapS shows 79 reports for plants in Minnesota ranging from individual trees to small groups to significant infestations. It is important to note that a number of the reports on EDDMapS are for planted trees.

Amur corktree has been grown at the Minnesota Landscape Arboretum since it was established in 1958. It has proven to be adaptable and fully hardy. Arboretum staff began to take note of the numerous seedlings establishing in the natural areas of the Arboretum. In 2008 the decision was made to remove all planted female corktrees. In 2015-16 a survey was done (see second image below) showing extensive escaped corktrees across the Arboretum. An active control program has been in place for several years. Despite the removal of mature fruiting escaped trees new seedling trees continue germinate from the seed bank throughout infested areas each year (Miller et al. 2016).

Arboretum staff also surveyed Powderhorn Park in St. Paul, Minnesota in 2015 in conjunction with studying the spread of corktree at the Arboretum. In addition to planted trees they observed seedlings in the non-mowed areas of the park (Miller et al. 2016). These observations are also supported by EDDMaps reports. In addition, the City of Saint Paul provided a lengthy list of documented escaped corktrees in in city parks.

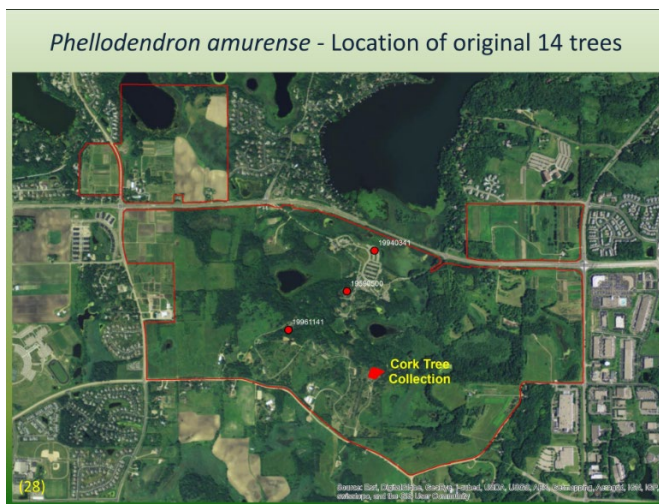


Figure caption: Location of original 14 *Phellodendron amurense* trees at the Minnesota Landscape Arboretum.



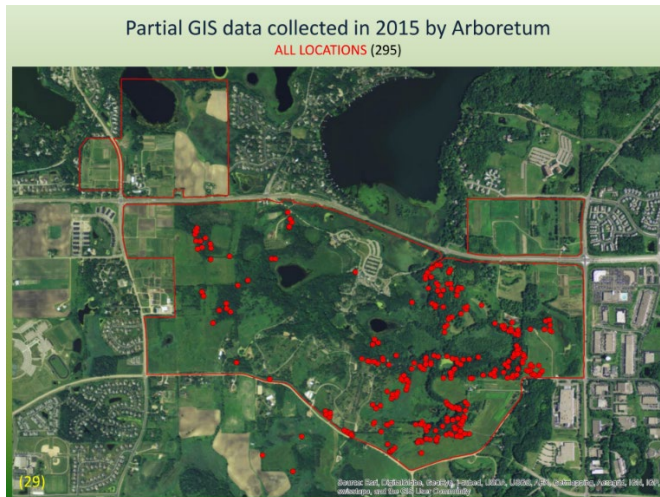


Figure caption: Locations of 295 *Phellodendron amurense* trees at the Minnesota Landscape Arboretum in 2015.

*Question 6B: Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?*

Outcome: Decision tree does not direct to this question.

*Question 6C: Has the plant become established in areas having a climate and growing conditions similar to those projected to be present in Minnesota under future climate projections?*

Outcome: Decision tree does not direct to this question.

---

#### **Box 7:**

#### **Does the species have the potential to reproduce and spread in Minnesota?**

*Question 7A: Are there cultivars of the plant that are known to differ in reproductive properties from the species?*

Answer: yes

Outcome: Go to Question 7B and follow the questions and also answer Question 7J

*P. amurense* is dioecious and named male cultivars have been introduced (see 7J).

*Question 7B: Does the plant reproduce by asexual/vegetative means?*

Answer: no

Outcome: Go to Question 7D

There are conflicting reports regarding regeneration in the natural habitat coming from abundant seed or from root suckering (USDA Forest Service 2008). Cut *Phellodendron* stumps readily sprout if not treated (Devries 2020).

*Question 7C: Are the asexual propagules - vegetative parts having the capacity to develop into new plants - effectively dispersed to new areas?*

Outcome: Decision tree does not direct to this question.

*Question 7D: Does the plant produce large amounts of viable, cold hardy seeds? For woody species, document the average age the species produces viable seed.*

Answer: yes

Outcome: Go to Question 7G

The Forest Service Woody Plant Seed Manual (USDA Forest Service 2008) summarizes propagation from seed for *Phellodendron* placing minimum seed-bearing age at 7 to 13 years within both the introduced and natural range. It also states that fresh seeds germinate well, and germination can also be of greatly improved following stratification. Corktrees produce a high volume of seed and have relative lack of seed predators (Simons 2006). A New York state ranking system report for invasive non-natives put seed production at greater than 1000 seeds per tree based on personal observations (Jordan et al. 2008).

*Question 7E: For species that produce low numbers of viable seeds, do they have a high level of seed/seedling vigor or remain viable for an extended period (seed bank)?*

Outcome: Decision tree does not direct to this question.

*Question 7F: Is the plant self-fertile?*

Outcome: Decision tree does not direct to this question.

*Question 7G: Are sexual propagules – viable seeds – effectively dispersed to new areas? List and consider all vectors.*

Answer: yes

Outcome: Go to Question 7I

*Phellodendron amurense* starts producing seed in trees as young as 3-5 years old. The abundant seed is consumed and dispersed by birds in the fall in winter (Simons 2006). Starlings, robins, mourning doves, mockingbirds and cedar waxwings were all reported to feed on *Phellodendron* at the Arnold Arboretum (Fordham 1967).

In its native range (China) birds routinely feed on *Phellodendron* fruit and disseminate seeds: “Regeneration and seed dispersal of *Phellodendron amurense* by frugivorous birds were studied at Maoedrshan and Harbin Forest Experiment Farms. Nine species of frugivorous birds fed on *P. amurense* fruits, while six of them were pulp-eating birds and three of them were seed-eating birds. Six species, which ate the whole fruits and defecated the seeds unhurt, were seed dispersers. The other three species were seed predators. Retention time of *P. amurense* fruits in the digestive systems of dispersers was between 20 and 30min. That means a long potential dispersing.” (Lu et al. 2004)

One author has suggested that seed can easily be transported by water, particularly streams, which seems likely, but no documented research has been located (Simons 2006).

*Question 7H: Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?*

Outcome: Decision tree does not direct to this question.

*Question 7I: Do natural controls, species native to Minnesota, which have been documented to effectively prevent the spread of the species in question?*

Answer: no

Outcome: Go to Box 8

Although there are documented fungi and insect species that can be found on *Phellodendron*, no documentation could be found of significant control by a species native to Minnesota.

“Four fungi and nine Lepidoptera were reported for the genus *Phellodendron*. Although all four fungi can infect *P. amurense*, *Ascochyta pirina* may be host – specific”. (Zheng et al. 2004)

*Question 7J: Was the answer to Question 7A (Are there cultivars that differ in reproductive properties from the original species) “Yes”?*

Answer: yes

Outcome: Document those cultivars and differences here

The following male corktree cultivars are considered fruitless or “generally fruitless”: (His Majesty and Longnecker): 'His Majesty', 'Macho', 'RNI 4551' Shademaster®, 'Supzam' Superfection™, 'Longenecker' Eye Stopper™. (Morton Arboretum 2020, Schmidt Nursery 2020)

---

#### **Box 8:**

**Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?**

*Question 8A: Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?*

Answer: no

Outcome: Go to Question 8B

No documentation could be found specifically linking *Phellodendron* to toxicity in livestock. Research in China found that *Phellodendron amurense* made up as much as 6.37% of the diet of red deer (Yankuo and Minghai 2005).

*Question 8B: Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?*

Answer: no

Outcome: Go to Question 8C

Although *Phellodendron amurense* can directly impact native oak and hickory regeneration when invading woodlands (Simons 2006) no documentation can be found quantifying impacts to timber production or agricultural crops.

*Question 8C: Can the plant aggressively displace native species through competition (including allelopathic effects)?*

Answer: yes

Outcome: Go to Box 9



In one study (Morgan 2012), *Phellodendron amurense* demonstrated a tendency to persist in the understory of an eastern North American forest (despite generally being considered by most sources as shade intolerant) and take advantage of opening in the canopy with the loss of a native overstory tree. Over time the numbers of *Phellodendron* increased to become the dominant species in the forest. It was noted that although most native tree species were readily browsed by deer corktree was not.

“Amur corktree outcompetes native tree and shrub species including oaks and hickories in forested natural areas. It may inhibit and suppress regeneration of overstory canopy trees. .... Oaks and hickories provide a nutritious fat-containing nut for wildlife that remains available through the winter, whereas corktree provides sugary berries that are lower in nutritional value. ... Because wildlife populations vary with the availability of acorns, populations of acorn-dependent species decrease in forests where Amur corktree has become established. ... It does especially well in forests and wooded areas that have been exposed to human disturbance, where it forms dense stands and crowds out native species. Corktree changes the light regime of forest understory with shelf-like branching that shades out seedlings of competing species. The high volume of seed produced and relative lack of seed predators gives it an additional competitive advantage over native species.” (Simons 2006)

In response to *Phellodendron* being identified as a species in need of evaluation for invasiveness in Massachusetts by the Massachusetts Invasive Species Advisory Group in 2000, Mass Audubon completed an Amur Corktree Mapping and Control Project starting in 2004. Mass Audubon (2020) states “Mass Audubon documented the presence and spread of this Amur corktree on several of its wildlife sanctuaries, providing supporting documentation for its designation as Likely Invasive in Massachusetts. ....At Ipswich River Wildlife Sanctuary, Amur corktree was found to have spread up to two miles from the point of introduction, and over 800 trees were located and measured. ....In several locations, Amur corktree was found to be the dominant tree species present. ....In 2011, a colony of Amur corktree was found at Waseeka Wildlife Sanctuary, including mature trees up to 24 inches in diameter at the base and numerous saplings and seedlings spread over several acres.”

Louis Wagner, a regional scientist with Mass Audubon, conducted the mapping work for the above surveys. He made the following comments concerning impacts: “In several areas, and in particular around the location of what we believed to be the original planting, *Phellodendron* was the dominant woody species over several acres. There were several other locations where *Phellodendron* had formed a dominant stand as well. It was sometimes mixed with black locust where it had colonized formerly open areas. It appeared that in many formerly open areas, *Phellodendron* and black locust (another invasive in Massachusetts) excluded native species from the surrounding forest (mostly oaks) from becoming established.” (Wagner 2020)

*Question 8D: Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?*

Outcome: Decision tree does not direct to this question.

*Question 8E: Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?*

Outcome: Decision tree does not direct to this question.

*Question 8F: Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?*

Outcome: Decision tree does not direct to this question.

---

**Box 9:**

**Does the species have clearly defined benefits that outweigh associated negative impacts?**

*Question 9A: Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?*

Answer: yes

Outcome: Go to Question 9B

8% of respondents of the 2020 MNLA survey responded that they are currently selling this species or its named cultivars. Only 2% of respondents indicated that the species is an indispensable source of income for their business (MNLA & MDA 2020).

*Question 9B: Is the plant an introduced species and can its spread be effectively and easily prevented or controlled, or its negative impacts minimized, through carefully designed and executed management practices?*

Answer: yes

Outcome: Go to Box 11

The plant is an introduced species. In discussions surrounding the nuances of this plant's biology and economic value, the listing subcommittee recommended that specially regulated plant is likely the appropriate category for this plant. This allows a clear explanation that any plant producing seeds should be controlled, even if it was initially sold as a male cultivar. This also allows the sale of male cultivars as current evidence does not support that most will produce seeds. While managing Amur corktree may not be "easy" as question 9B states, it is possible to produce an effective management plan to reduce impacts of existing trees, reduce the chance of additional fruiting trees being planted on the landscape, and allow the sale of male cultivars in support of the landscape industry.

*Question 9C: Is the plant native to Minnesota?*

Outcome: Decision tree does not direct to this question.

*Question 9D: Is a non-invasive, alternative plant material or cultivar commercially available that could serve the same purpose as the plant of concern?*

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***

There are named introduced male cultivars of *Phellodendron amurense* but there are observations that some specimens believed to be male have produced fruit on occasion (Hauer 2020) including introduced named male cultivars (Dreisilker 2020, Devries 2020). Some male cultivars (His Majesty and Longnecker) are described as "generally fruitless" by Schmidt nursery (Schmidt Nursery 2020) implying that they can or do produce fruit at times. Schmidt Nursery was an original nursery licensed to sell Longnecker corktree when introduced (WHPS 2011). In addition, since male cultivars are grafted on

the species, there is always the possibility of sprouted rootstock producing fruit. This can happen in as quickly as five years (Hauer 2020).

In 2020 a citizen science project was initiated by Angela Gupta, an Extension Professor at the University of Minnesota. The project was intended to report, track and record gender of Amur corktrees. Volunteers observed 77 trees in the Rochester, Mankato and Twin Cities areas of Minnesota. Results significant to the question of reliability of “male” cultivars where that of the 22 trees observed to flower or fruit, 6 trees with observed male flowers later had fruit or evidence of fruit (“fruit stems”). Four trees reported to be the cultivars Longnecker and His Majesty (two specimens of each) were among those reported to have fruit (Gupta 2021).

*Question 9E: Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?*

Outcome: Decision tree does not direct to this question.

---

**Box 10:**

**Should the species be regulated as Prohibited/Eradicate, Prohibited/Control, or Restricted Noxious Weed?**

*Question 10A: Is the plant currently established in Minnesota?*

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***

An inventory of “public trees” from the City of Minneapolis dating to February 2021 listed a total of 1578 Amur corktree including 735 specimens of the cultivar His Majesty and 715 of Longnecker. A list provided by the City of Saint Paul for 2021 showed a total of 527 corktrees, 158 of which are fruiting specimens. The Saint Paul data also contained a list of 814 escaped corktrees growing in two different city parks.

Amur corktree has proven to be a challenging and ongoing eradication effort on the 1000+ acres at the Minnesota Landscape Arboretum. Corktree escape and spread necessitated the removal of all planted female trees in 2009. (Miller et al. 2016)

EDDMapS currently lists 79 reports of the species in Minnesota. As noted previously, not all of these reports are escapes.

*Question 10B: Would prohibiting this species in trade prevent the likelihood of introduction and/or establishment?*

Outcome: Decision tree does not direct to this question.

*Question 10C: Does this risk assessment support this species being a top priority for statewide eradication if found in the state?*

Outcome: Decision tree does not direct to this question.

*Question 10D: Does the plant pose a serious human health threat?*

Answer: *This information is supplemental and is not part of the flow chart pathway for this risk assessment.*  
No reference can be found to human toxicity of *Phellodendron*. Many studies in Asia highlight the benefits on antioxidants in *Phellodendron*.

*Question 10E: Is the health threat posed by the plant serious enough, and is the plant distribution sufficiently small enough to be manageable, and are management tools available and effective enough to justify listing as Prohibited / Eradicate species?*

Outcome: Decision tree does not direct to this question.

*Question 10F: Is the plant known to cause significant ecological or economic harm and can the plant be reliably eradicated (entire plant) on a statewide basis using existing practices and available resources considering the distribution, reproductive biology and potential for spread?*

- *For distribution, note if the distribution is well documented, the number and acreage of known infestations and how widespread they are in the state. Note if there are infestations in border areas.*
- *For reproductive biology, note if there are reproductive biology factor that make the plant easier to control and eradication more likely (for example, long pre-reproductive period, self-incompatible pollination, short-lived seed bank).*
- *For potential for spread and re-invasion of controlled areas, note its potential to spread beyond places where it is being controlled such as deliberate planting by people, wildlife vectors, re-infestation from border states, or other factors that facilitate spread.*
- *For known management tools, note what management tools are available, potential non-target impacts, and the reasonableness of state management or mandating that landowners throughout the state use the management tools to eradicate or control existing plants.*
- *For available resources, consider the capacity of state and local personnel and availability of funding to respond to new and existing infestations.*

Outcome: Decision tree does not direct to this question.

*Question 10G: Is the plant known to cause significant ecological or economic harm and can the plant be reliably controlled to limit spread on a statewide basis using existing practices and available resources? Would the economic impacts or other hardships incurred in implementing control measures be reasonable considering any ongoing or potential future increase of ecological or economic harm?*

- *Also consider all bullet points listed under 10F when evaluating 10G*

Outcome: Decision tree does not direct to this question.

*Question 10H: Would prohibiting this species in trade have any significant or measurable impact to limit or reduce the existing populations or future spread of the species in Minnesota?*

Outcome: Decision tree does not direct to this question.

Question 10I: Are there any other measures that could be put in place as Special Regulations which could mitigate the impact of the species within Minnesota?

Outcome: Decision tree does not direct to this question.

---

**Box 11:**

**The species is being proposed to be designated as a Specially Regulated Plant. What are the specific regulations proposed?**

Outcome: Only sales of named male cultivars are permitted. Sales of all other *Phellodendron amurense* are prohibited. All existing planted and escaped fruit producing trees must be controlled, by tree removal or other means, such that no seed is disseminated.

*The information below is supplemental in support of the proposed regulation.*

The species has been documented in other states to spread extensively from planted trees (several trees to hundreds) and displace other woodland species by suppressing regeneration of native species. Documented reports in Minnesota are concentrated in urban areas on managed lands. This provides an opportunity for cities and land managers to control seed producing planted trees and escapes which in many cases are single specimens before the numbers spread. Predicting spread patterns of bird disseminated seed is difficult and the longevity of seed viability makes the likelihood of invasion or reinvasion high for minimally managed parks and natural areas.

Although the removal of fruiting trees is costly, it is a proven and effective means of removing the main sources of seed. Given the possibility of dissemination by birds from street trees and escaped fruiting trees, the potential for uncontrolled spread is significant. The documented potential for the species to become dominant in the over story in portions of invaded woodlands is cause for concern of future ecological harm.

Although there is limited documentation that some planted “male” cultivars are producing limited amounts of fruit, further research is warranted on the reproductive biology of *Phellodendron amurense* to understand whether the species is strictly dioecious and whether seed from these taxa are viable.

---

**Final recommendations of risk assessment (2021)****NWAC Listing Subcommittee**

Outcome: List as a Specially Regulated Plant with only sales of named male cultivars permitted. Sales of all other *Phellodendron amurense* are prohibited. All existing planted and escaped fruit producing trees must be controlled, by tree removal or other means, such that no seed is disseminated. (07/22/2021)

Comments: The subcommittee reached full consensus on recommendation. Given the uncertainty about the reproductive biology of the species the subcommittee had reservations about listing the species under a Prohibited Control designation at this time. The subcommittee agreed that listing the plant as specially regulated offered the most flexibility for controlling the future spread of corktree.



### **NWAC Full Committee**

Outcome: List as a Specially Regulated Plant with only sales of named male cultivars permitted. Sales of all other *Phellodendron amurense* are prohibited. All existing planted and escaped fruit producing trees must be controlled, by tree removal or other means, such that no seed is disseminated. (12/14/2021)

Comments: The vote was 14 in favor, 1 against and 2 abstained.

### **MDA Commissioner**

Outcome: List as a Specially Regulated Plant with only sales of named male cultivars permitted. Sales of all other *Phellodendron amurense* are prohibited. All existing planted and escaped fruit producing trees must be controlled, by tree removal or other means, such that no seed is disseminated.

Comments: No comments

### **Risk Assessment Current Summary**

The risk assessment finds that the species *Phellodendron amurense* is fully hardy in Minnesota. The species is documented to have escaped and spread in Minnesota and several other states. Several other states have listed in at some level of regulation. It is present in Minnesota both as planted and escaped trees. Significant numbers of corktrees have been planted in the cities of Minneapolis and Saint Paul. Good portions of these are documented fruit producing trees. It has shown the tendency to be spread readily by birds and escape in large numbers into natural woodlands as demonstrated at the Minnesota Landscape Arboretum and the City of Saint Paul parks. The species has showed the potential for significant spread in both Minnesota and other Midwestern and eastern states. Documentation of impacts from invasion of corktree are not extensive but point to exclusion of native overstory trees as the primary impact.

Only 8% of the respondents to the 2020 MNLA nursery survey indicated they are selling *Phellodendron amurense* making it unlikely that only restricting its sale would have much effect on controlling potential spread and ecological harm. Male cultivars exist but there is limited documented reporting that some named “male” cultivars have been observed producing fruit. A citizen science project conducted in 2020 in Rochester, Mankato and Twin Cities found examples of trees that had documented male flowers in the spring or where planted as named male cultivars producing later in the season. The large number of these cultivars growing in the Twin Cities is cause for concern, as is the possibility of rootstock also producing fruit.

Given the uncertainty about the reproductive biology of the species, the subcommittee had reservations about listing the species under a Prohibited/Control designation at this time. The subcommittee agreed that listing the plant as specially regulated offered the most flexibility for controlling the future spread of corktree.

### **References**

Devries, Richard. 2020. Natural Resources Manager. Minnesota Landscape Arboretum. Personal communication with David Stevenson on 26 May 2020.

Dreisilker, Kurt. 2020. Head of Natural Resources and Collections Horticulture, The Morton Arboretum. Personal communication with David Stevenson on 31 July 2020.

Fordham, Alfred J. 1967. Seed Dispersal by Birds and Animals in the Arnold Arboretum. *Arnoldia* 27(10/11): 73-84.

Gupta, Angela. 2021. Gender Bending Trees: Amur corktree 2020 Cit Sci Project Report. Regents of the University of Minnesota.

Hauer, Richard. 2020. Professor of Urban Forestry, University of Wisconsin-Stevens Point. Personal communication with David Stevenson on 31 July 2020.

Indiana Department of Natural Resources. [Terrestrial Invasive Species – Plants](https://www.in.gov/dnr/6351.htm). <https://www.in.gov/dnr/6351.htm>. Accessed 20 July 2020.

Jordan, M.J., G. Moore and T.W. Weldy. 2008. Invasiveness ranking system for non-native plants of New York. Unpublished. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY.

Lu, Changhu, Jiachuan Chang and Qing Xu. 2004. Regeneration of *Phellodendron amurense* and its seed dispersal by frugivorous birds *Chinese Journal of Ecology*. 23(1) 24-29. CBA:482122.

Ma, Jinshuang, W. Cao, Q. Liu , M. Yu , and L. Han. 2006. A revision of *Phellodendron* (Rutaceae). *Edinburgh Journal of Botany* 63: 131 - 151. 10.1017/S0960428606000515.

Mass Audubon. 2020. Amur corktree mapping and control project. <https://www.massaudubon.org/our-conservation-work/ecological-management/habitat-management/invasive-species/projects/amur-corktree-mapping-and-control-project>. Accessed 24 August 2020.

Mass.gov. [Massachusetts Prohibited Plant List](https://www.mass.gov/service-details/massachusetts-prohibited-plant-list). <https://www.mass.gov/service-details/massachusetts-prohibited-plant-list>. Accessed 17 January 2020.

Miller, D., R. DeVries, J. Malysza, D. Stevenson and R. Gjertson. 2016. Potential Invasiveness of the Amur Corktree in Minnesota (poster). University of Minnesota Landscape Arboretum Chaska, Minnesota.

MNLA & MDA- Minnesota Nursery Landscape Association and Minnesota Department of Agriculture. 2020. 2020 Nursery Industry Survey.

Morgan, Eric C. 2012. Stand Dynamics of a 46-Year Invasion by *Phellodendron amurense* Rupr. in an Eastern North American Forest. *Castanea* 77(1): 21-27.

- Morgan, Eric C. and Jon A. Borysiewicz. 2012. [The Invasion of \*Phellodendron amurense\* into the Urban and Suburban Woodlands of the New York City Region](http://www.urbanhabitats.org/v07n01/phellodendron_full.html). Urban Habitats. [http://www.urbanhabitats.org/v07n01/phellodendron\\_full.html](http://www.urbanhabitats.org/v07n01/phellodendron_full.html). Accessed 3 March 2020.
- Morton Arboretum. 2020. [Amur corktree \(male only\)](https://www.mortonarb.org/trees-plants/tree-plant-descriptions/amur-corktree-male-only). <https://www.mortonarb.org/trees-plants/tree-plant-descriptions/amur-corktree-male-only>. Accessed 17 March 2020.
- New York State Dept. of Environmental Conservation. 2020. [6 NYCRR Part 575 Prohibited and Regulated Invasive Species September 10, 2014](http://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf). [http://www.dec.ny.gov/docs/lands\\_forests\\_pdf/islist.pdf](http://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf). Accessed 30 July 2020.
- Schmidt Nursery. 2020. [JFS Introductions](https://www.jfschmidt.com/introductions/eyestopper/index.html). <https://www.jfschmidt.com/introductions/eyestopper/index.html>
- Simons, Dani. 2006. [Weeds Gone Wild: Alien Plant Invaders of Natural Areas](https://www.invasive.org/alien/fact/pham1.htm). Plant Conservation Alliance's Alien Plant Working Group. <https://www.invasive.org/alien/fact/pham1.htm>. Accessed 26 May 2020.
- Snyder, Leon C. 1980. Trees and Shrubs for Northern Gardens. University of Minnesota Press.
- U.S. Dept. of Agriculture, Forest Service. 2008. [The Woody Plant Seed Manual](https://www.fs.fed.us/rm/pubs_series/wo/wo_ah727.pdf). [https://www.fs.fed.us/rm/pubs\\_series/wo/wo\\_ah727.pdf](https://www.fs.fed.us/rm/pubs_series/wo/wo_ah727.pdf). Accessed 16 March 2020.
- Wagner, Louis. 2020. Regional Scientist (retired), Mass Audubon. Personal communication with David Stevenson on 3 August 2020.
- Wisconsin Department of Natural Resources. 2019. Regulated as a prohibited species in Wisconsin except for male cultivars and seedling rootstock. <https://dnr.wi.gov/topic/Invasives/fact/AmurCorkTree.html>. Accessed 17 January 2020.
- Wisconsin Hardy Plant Society (WHPS). 2011. Newsletter of the Wisconsin Hardy Plant Society. January 2011.
- Yankuo, Li and Zhang Minghai. 2005. Food-habits of Red Deer in Winter in Wanda Mountain Forest Region. Journal of Northeast Forestry University 33(3): 104-105. CBA:568335.
- Zheng, H., Y. Wu, J. Ding, D. Binion, W. Fu and R. Reardon. 2004. Invasive Plants of Asian Origin Established in the United States and Their Natural Enemies Volume 1. Chinese Academy of Agricultural Sciences Institute of Environment and Sustainable Development in Agriculture Biological Control Laboratory and the USDA Forest Service.