Plant Risk Evaluator -- PRE™
Evaluation Report

Acer platanoides -- Minnesota

2017 Farm Bill PRE Project

PRE Score: 14 -- Evaluate this plant further
Confidence: 72 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Completed

Evaluation Date: March 13, 2017

This PDF was created on June 15, 2018

Plant Evaluated

Acer platanoides

Image by Martin Bobka

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Acer platanoides*) in an effort to understand the invasive history, reproductive strategies, and the impact, if any, on the region's native plants and animals. This research reflects the data available at the time this evaluation was conducted.

General Information

Status: Completed
Screener: Steve McNamara
Evaluation Date: March 13, 2017

Plant Information

Plant: *Acer platanoides*

Regional Information

Region Name: Minnesota

Climate Matching Map

To answer four of the PRE questions for a regional evaluation, a climate map with three climate data layers (Precipitation, UN EcoZones, and Plant Hardiness) is needed. These maps were built using a toolkit created in collaboration with GreenInfo Network, USDA, PlantRight, California-Invasive Plant Council, and The Information Center for the Environment at UC Davis.

Click here to see the generated climate matching map for this region. This climate match database is hosted by GreenInfo Network and publicly accessible.

Evaluation Questions

These questions are based in an original article published at the University of California, Davis, and can be found on the PLOS One website, here: https://doi.org/10.1371/journal.pone.0121053

Invasive History and Climate Matching (Questions 1 - 6)

1. Has the species (or cultivar or variety, if applicable; applies to subsequent "species" questions) become naturalized where it is not native?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

The species has naturalized throughout much of the northeastern, mid-Atlantic, midwestern and western United States. Relatively young seedlings can be found in wooded areas near the Maple Collection at the Minnesota Landscape Arboretum.

Reference(s):

- Webb, S. L., & Kaunzinger C. Kalafus (1993). Biological Invasion of the Drew University (New Jersey) Forest Preserve by Norway Maple (Acer platanoides L.). Bulletin of the Torrey Botanical Club. 120, 343–349.
- The University of Georgia - Center for Invasive Species and Ecosystem Health (0). Norway maple (Acer platanoides) - EDDMapS State Distribution.
- Anderson, R.. (1999). Disturbance as a factor in the distribution of sugar maple and the invasion of Norway maple into a modified woodland. Rhodora. 101, 264–273.
- University of Montana (2017). INVADERS database system - University of Montana.

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2. Is the species (or cultivar or variety) noted as being naturalized in the US or world in a similar climate?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides is reportedly naturalized in portions of Wisconsin and Minnesota as well as areas in the Rocky Mountains of Montana.

Reference(s):

- Reinhart, K. O., Gurnee J., Tirado R., & Callaway R. M. (2006). Invasion Through Quantitative Effects: Intense Shade Drives Native Decline and Invasive Success. Ecological Applications. 16, 1821–1831.
- Reinhart, K. O., Greene E., & Callaway R. M. (2005). Effects of Acer platanoides Invasion on Understory Plant Communities and Tree Regeneration in the Northern Rocky Mountains. Ecography. 28, 573–582.
- Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.

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3. Is the species (or cultivar or variety) noted as being invasive in the U.S. or world?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides is considered invasive throughout portions of the northeastern, mid-Atlantic, midwestern, and western United States.

Reference(s):

- Reinhart, K. O., Greene E., & Callaway R. M. (2005). Effects of Acer platanoides Invasion on Understory Plant Communities and Tree Regeneration in the Northern Rocky Mountains. Ecography. 28, 573–582.
- Martin, P. H. (1999). Norway Maple (Acer platanoides) Invasion of a Natural Forest Stand: Understory Consequence and Regeneration Pattern. Biological Invasions. 1, 215–222.
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
- Lapointe, M., & Brisson J. (2012). A Comparison of Invasive Acer platanoides and Native A. saccharum First-Year Seedlings: Growth, Biomass Distribution and the Influence of Ecological Factors in a Forest Understory. Forests. 3, 190–206.
- Webb, S. L., & Kaunzinger C. Kalafus (1993). Biological Invasion of the Drew University (New Jersey) Forest Preserve by Norway Maple (Acer platanoides L.). Bulletin of the Torrey Botanical Club. 120, 343–349.
- Wyckoff, P. H., & Webb S. L. (1996). Understory Influence of the Invasive Norway Maple (Acer platanoides). Bulletin of the Torrey Botanical Club. 123, 197–205.
- Mehrhoff, L.. J., Jr. J.. A. Silande, Leight S.. A., Mosher E.. S., & Tabak N.. M. (2003). IPANE: invasive plant atlas of New England.
- Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.

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4. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

- Answer: **Yes**, which contributes **3** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides is currently on the invasive plant list of the Invasive Plant Association of Wisconsin. There are few reports of the species being invasive throughout the rest of the Climate Match range. It has been found invading riparian and mesic montane forests in the northern Rocky Mountains of Montana where minimum winter temperatures are comparable to those of Minnesota, but the Montana region is more arid and therefore may not provide an adequate climatic analogue.

Reference(s):

- Invasive Plants Association of Wisconsin (IPAW) (0). IPAW's Working List of Invasive Plants of Wisconsin.
- Reinhart, K. O., Gurnee J., Tirado R., & Callaway R. M. (2006). Invasion Through Quantitative Effects: Intense Shade Drives Native Decline and Invasive Success. Ecological Applications. 16, 1821–1831.
- Reinhart, K. O., Greene E., & Callaway R. M. (2005). Effects of Acer platanoides Invasion on Understory Plant Communities and Tree Regeneration in the Northern Rocky Mountains. Ecography. 28, 573–582.

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5. Are other species of the same genus (or closely related genera) invasive in a similar climate?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Acer tataricum ssp. ginnala (Amur maple) is an invasive species in Minnesota and other parts of the U.S. with a similar climate.

Reference(s):

- Minnesota Department of Agriculture (2017). Amur maple - Invasive species: Minnesota DNR.
- Wisconsin DNR (2015). Invasive species - Wisconsin DNR.

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6. Is the species (or cultivar or variety) found predominately in a climate matching the region of concern?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

More than half of the areas where Acer platanoides is native or has naturalized are in warmer climate zones than Minnesota.

Reference(s):

- The University of Georgia - Center for Invasive Species and Ecosystem Health (0). Norway maple (Acer platanoides) - EDDMapS State Distribution.
- Mehrhoff, L.. J., Jr. J.. A. Silande, Leight S.. A., Mosher E.. S., & Tabak N.. M. (2003). IPANE: invasive plant atlas of New England.
- Nowak, D. J., & Rowntree R. A. (1990). History and range of Norway maple. Journal of Arboriculture. 16, 291–296.
- Schmucker, T.. (1942). The Tree Species of the Northern Temperate Zone and their Distribution. Silvae Orbis. 4,
- EUFORGEN Secretariat (0). Acer platanoides - EUFORGEN European forest genetic resources programme.

Impact on Native Plants and Animals (Questions 7 - 10)

7. Does this plant displace native plants and dominate (overtop or smother) the plant community in areas where it has established?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides has been shown to displace native tree species such as Acer saccharumand reduce forest diversity.

Reference(s):

- Galbraith-Kent, S. L., & Handel S. N. (2008). Invasive Acer platanoides inhibits native sapling growth in forest understorey communities. Journal of Ecology. 96, 293–302.
- Wyckoff, P. H., & Webb S. L. (1996). Understory Influence of the Invasive Norway Maple (Acer platanoides). Bulletin of the Torrey Botanical Club. 123, 197–205.
- Martin, P. H. (1999). Norway Maple (Acer platanoides) Invasion of a Natural Forest Stand: Understory Consequence and Regeneration Pattern. Biological Invasions. 1, 215–222.
- Reinhart, K. O., Greene E., & Callaway R. M. (2005). Effects of Acer platanoides Invasion on Understory Plant Communities and Tree Regeneration in the Northern Rocky Mountains. Ecography. 28, 573–582.

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8. Is the plant noted as promoting fire and/or changing fire regimes?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

I could find no reports of Acer platanoides promoting fire or changing fire regimes, suggesting that this is not a primary feature of its invasive impact.

Reference(s):

- Dibble, A. C., Zouhar K., & Smith J. Kapler (2008). Fire and Nonnative Invasive Plants in the Northeast Bioregion.

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9. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

I could find no reports of Acer platanoides presenting a health risk to humans or animals/fish.

Reference(s):

- Cornell University (0). Department of Animal Science - Plants Poisonous to Livestock.
- Texas A&M AgriLife Extension (0). Common Poisonous Plants and Plant Parts \textbar Earth-Kind® Landscaping.
- HOVANET, MARILENA-VIORICA., DOCIU NICULINA., DINU MIHAELA., ANCUCEANU ROBERT., MOROSAN ELENA., & OPREA ELIZA. (2015). A Comparative Physico-chemical Analysis of Acer platanoides and Acer pseudoplatanus Seed Oils (PDF Download Available). Revista de Chimie - Bucharest. 66, 987–991.
- Cornell University Department of Animal Science (0). Plants Poisonous to Livestock.

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10. Does the plant produce impenetrable thickets, blocking or slowing movement of animals, livestock, or humans?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

The density of Acer platanoides plants reported in plots studied for several decades following initial establishment would likely be insuffficient to provide a physical barrier to movement.

Reference(s):

- Martin, P. H. (1999). Norway Maple (Acer platanoides) Invasion of a Natural Forest Stand: Understory Consequence and Regeneration Pattern. Biological Invasions. 1, 215–222.
- Wangen, S. R., & Webster C. R. (2006). Potential for Multiple Lag Phases during Biotic Invasions: Reconstructing an Invasion of the Exotic Tree Acer platanoides. Journal of Applied Ecology. 43, 258–268.

Reproductive Strategies (Questions 11 - 17)

11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

I could find no reports of Acer platanoides reproducing/spreading vegetatively under natural conditions nor have I ever observed this personally. Sexual reproduction by seed is clearly the focus in the scientific literature. While there is some evidence that Norway maple can be reproduced from softwood cuttings, special treatment of cuttings (application of plant growth regulators and provision of high humidity conditions) is required for this to occur. In commercial practice, the species is produced from seed while cultivars of the species are produced almost exclusively by grafting (budding).

Reference(s):

- Chapman, D. J. (1979). Propagation of Acer campestre, A. platanoides, A. rubrum, and A. ginnala by cuttings. Proceeding of the International Plant Propagator's Society. 29, 345–347.
- Dirr, M., & Heuser, Jr. C. W. (2006). The reference manual of woody plant propagation: from seed to tissue culture.

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12. If naturally detached fragments from this plant are capable of producing new plants, is this a common method of reproduction for the plant?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

I could find no reports in the literature of any instances of Acer platanoides regenerating from detached plant fragments nor have I ever observed this phenomenon myself. Again, in the scientific literature, the discussion of reproductive capability focuses very heavily, if not exclusively, on sexual reproduction.

Reference(s):

- [Anonymous] .

13. Does the species (or cultivar or variety) commonly produce viable seed?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Reference(s):

- Conklin, J. R., & Sellmer J. C. (2009). Flower and Seed Production of Norway Maple Cultivars. HortTechnology. 19, 91–95.
- Carón, M.. M., De Frenne P.., Brunet J.., Chabrerie O.., Cousins S.. a. O., De Backer L.., et al. (2014). Latitudinal variation in seeds characteristics of Acer platanoides and A. pseudoplatanus. Plant Ecology. 215, 911–925.
- McNamara, S., Gervais M., & Hokanson S. C. (2010). Evaluating the invasive potential of Norway maple (Acer platanoides L.) and Amur maple (Acer tataricum L. ssp.ginnala) in central Minnesota - initial results.

14. Does this plant produce copious viable seeds each year (> 1000)?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Reference(s):

- Conklin, J. R., & Sellmer J. C. (2009). Germination and Seed Viability of Norway Maple Cultivars, Hybrids, and Species. HortTechnology. 19, 120–126.
- Conklin, J. R., & Sellmer J. C. (2009). Flower and Seed Production of Norway Maple Cultivars. HortTechnology. 19, 91–95.

15. Is there significant germination (>25%) of seeds the next growing season, with no requirement of an infrequent environmental condition for seeds to germinate (i.e. fire) or long dormancy period?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Norway maple seed requires a simple cold stratification period of 90 - 120 days for germination. Reported seed germination percentages varied with parental genotype and germination conditions, but germination rates as high as 81% have been reported.

Reference(s):

- McNamara, S., Gervais M., & Hokanson S. C. (2010). Evaluating the invasive potential of Norway maple (Acer platanoides L.) and Amur maple (Acer tataricum L. ssp.ginnala) in central Minnesota - initial results.
- Conklin, J. R., & Sellmer J. C. (2009). Germination and Seed Viability of Norway Maple Cultivars, Hybrids, and Species. HortTechnology. 19, 120–126.
- Dirr, M., & Heuser, Jr. C. W. (2006). The reference manual of woody plant propagation: from seed to tissue culture.
- Olson, D.. F., & Gabriel W.. J. (1974). Acer In Seeds of Woody Plants of the United States. Seeds of Woody Plants of the United States. 187–194.

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16. Does this plant produce viable seed within the first three years (for an herbaceous species) to five years (for a woody species) after germination?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

No, Norway maple has a relatively long juvenile period and typically doesn't begin producing seed for 25-30 years.

Reference(s):

- Gordon, A.. G. (1982). Seed manual for ornamental trees and shrubs.

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17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

No. Acer platanoides bears seed one time annually and the seed is relatively non-persistent, dispersing over a period of several weeks in the fall when mature.

Reference(s):

- van Gelderen, D.. M. (1994). Maples of the world.
- Dirr, M. (2009). Manual of woody landscape plants: their identification, ornamental characteristics, culture, propagation, and uses.
- McNamara, S., Gervais M., & Hokanson S. C. (2010). Evaluating the invasive potential of Norway maple (Acer platanoides L.) and Amur maple (Acer tataricum L. ssp.ginnala) in central Minnesota - initial results.

Dispersal (Questions 18 - 20)

18. Are the plant's propagules frequently dispersed long distance (>100 m) by mammals or birds or via domestic animals?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoide's seed dispersal is primarily accomplished by wind and therefore typically does not exceed 100 m. Wangen and Webster theorized that seeds of Norway maple had likely been transported longer distances on Mackinac Island by adhering to horse hooves (and possibly by motorized vehicles as well). Thus horses would represent a viable mammalian mechanism by which Norway maple seeds could be dispersed over long distances. but this wouldn't likely be a common occurrence in most areas where the species occurs.

Reference(s):

- Wangen, S. R., & Webster C. R. (2006). Potential for Multiple Lag Phases during Biotic Invasions: Reconstructing an Invasion of the Exotic Tree Acer platanoides. Journal of Applied Ecology. 43, 258–268.
- van Gelderen, D.. M. (1994). Maples of the world.

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19. Are the plant’s propagules frequently dispersed long distance (>100 m) by wind or water?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides fruit is a fairly large samara 3-5 cm long that is unlikely to be dispersed distances > 100 m by wind. Seeds are not particularly buoyant so long-distance dispersal by water also seems unlikely.

Reference(s):

- Dirr, M. (2009). Manual of woody landscape plants: their identification, ornamental characteristics, culture, propagation, and uses.
- van Gelderen, D.. M. (1994). Maples of the world.

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20. Are the plant’s propagules frequently dispersed via contaminated seed (agriculture or wildflower packets), equipment, vehicles, boats or clothing/shoes?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Acer platanoides seed does not appear to be particularly well adapted for dispersal via artificial means such as equipment or vehicles. However, Wangen and Webster"s work indicated that long-distance dispersal of Norway maple seed on Mackinac Island occurred along roads and trail corridors. While the mechanism of dispersal in that instance was most likely horses/horsehorse-drawn carriages, the pattern of dispersal suggests Norway maple seed could potentially be transported long distances via adherence to vehicles/equipment.

Reference(s):

- Wangen, S. R., & Webster C. R. (2006). Potential for Multiple Lag Phases during Biotic Invasions: Reconstructing an Invasion of the Exotic Tree Acer platanoides. Journal of Applied Ecology. 43, 258–268.

Total PRE Score

PRE Score: 14 -- Evaluate this plant further
Confidence: 72 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

PRE Score Legend

The PRE Score is calculated by adding the point totals for each (answered) question.
< 13 : accept (low risk of invasiveness)
13 - 15 : evaluate further
> 15 : reject (high risk of invasiveness)

Questions Answered Legend

It is important to answer at least 16 questions to consider a PRE Score as "valid".
>= 16 : valid (80% or more questions answered)
<= 15 : invalid (not enough questions answered)

Organization Ownership and Content Privacy

Organization: 2017 Farm Bill PRE Project
Content Privacy: Public

Evaluation Reviewers

The PRE approach is to base decisions on science and make decisions by consensus of diverse horticultural stakeholders. The literature review and process of answering PRE's questions are based on science; the decisions of which plants to prioritize are based on consensus. To ensure this process is in place and that PRE is collaborative, volunteer stakeholders are recruited from each region to review evaluations. The following experts in their profession (plant science, conservation, or horticultural trade) have participated as volunteer PRE reviewers for this evaluation:

• Angelique Dahlberg	December 2, 2017
• Tom Buechel	November 9, 2017

This evaluation has a total of 2 reviewer(s).

Evaluation Issues

The following section lists all public issues for this evaluation. Issues provide a way for stakeholder reviewers to communicate any concerns or suggestions they might have with the plant or evaluation. Please email PlantRight@suscon.org if additional action is required to resolve open issues.

There are currently no issues associated with this evaluation.

About PRE and this Plant Evaluation Report

The PlantRight Plant Risk Evaluator -- PRE is an online database and platform enabling those involved in non-native, terrestrial plant production to know before they grow if a plant poses a regional invasive risk. This tool offers many benefits, and we encourage you to visit the PRE website (https://pre.ice.ucdavis.edu) for more information.

If you are a nursery trade association, or involved in the research, development or distribution of horticultural plants we invite you to join the PRE community. If you are a plant scientist, affiliated with a horticultural college or botanic garden, and would like to learn more about becoming a PRE Screener, please drop us an email, PlantRight@suscon.org, requesting a PRE Account.

PRE beta funding is provided by Sustainable Conservation (http://www.suscon.org/) and a USDA Farm Bill grant.