

MN NWAC Risk Assessment Worksheet (04-2017)	Common Name	Latin Name (Full USDA Nomenclature)
	Norway Maple (Other Common Names – None)	<i>Acer platanoides</i> L. (Synonyms – None)
Original Reviewer: James Calkins	Affiliation/Organization: Minnesota Nursery and Landscape Association (MNLA)	Original Review: 04/13/2018 & 07/11/2018
Current Reviewer: James Calkins	Affiliation/Organization: Minnesota Nursery and Landscape Association (MNLA)	Current Review Date: 08/24/2018

Species Description:

Appearance: Norway maple (*Acer platanoides*) is a medium to fairly large (generally 40-60 feet tall, but some individuals can grow to 90 feet tall or more), shade tree with a rounded, sometimes upright-oval, habit. The species exhibits considerable phenotypic variability and over 100 named cultivars have been selected based on size, form (columnar to weeping), and foliage characteristics including color (various shades of green, burgundy-green, burgundy, and variegated) and shape (variously 5-lobed to deeply dissected). Trees have a shallow root system and exposed surface roots can be a problem if trees are under-planted with turf; in addition, the canopy is dense and the resulting shade is problematic for turf and all but the most shade tolerant species. Compared to other maples, the flowers are relatively large and trees can be quite showy when in flower. Fall color usually does not develop well in Minnesota, but can be a good yellow to golden yellow in years with an extended fall and suitable conditions.

Family: Sapindaceae (Soapberry Family); formerly in the Aceraceae (Maple Family) which, along with the Hippocastanaceae (Horse Chestnut Family), has recently been merged with the Sapindaceae based on recent phylogenetic research.

Habitat: Native to lowlands, river valleys, and low mountainous areas in Eurasia, Norway maple has been distributed widely in temperate regions worldwide by human activities. In its native range it is typically not a dominant species and is generally found as individuals or in small groups in forest ecosystems. Although it is quite adaptable, Norway maple prefers mesic sites with deep, fertile, well-drained, loamy soils and a



pH of 5.5-6.5 (higher pH's are tolerated, but performance is poor on more acidic soils). Norway maple is a tough, vigorous, fast-growing tree with a wide tolerance for light (from full sun to part shade) and soil type (from clay to loam to sand in composition, and either acidic and alkaline). It is known to be tolerant of pollution and flooding and grows successfully in most situations including in compacted soil in crowded and hostile urban environments. This tolerance makes Norway maple an effective invader of disturbed areas when other conditions are suitable. Norway maple's primary limitations as a landscape plant include cold hardiness (Zones 4-7b), excessive heat, excessively high or low soil pH, and high levels of evapotranspiration relative to rainfall.

Acer platanoides has a dense canopy that casts extremely dense shade and has a shallow root system; as a result, it is notorious for suppressing lawn grasses planted under trees in designed landscapes. The same impacts, deep shade and competition for water and nutrients, are also effective in suppressing both the growth and diversity of native species in naturalized settings. Norway maple has no serious insect or disease problems with the exception of verticillium wilt (*Verticillium dahlia*) and the Asian long-horned beetle (not yet documented in Minnesota or neighboring states); the cultivars 'Jade Glen' and 'Parkway' have shown resistance to verticillium wilt and exhibit few if any symptoms.

Distribution: Norway maple is native to central and eastern Europe and western Asia and is the most widely distributed maple in Europe. More specifically, Norway maple is native from southern Norway, Sweden, and Finland south to eastern Spain and the Mediterranean Sea and west to Turkey, northern Iran, and western Russia. Norway maple was introduced to North America from Europe in 1756 (Philadelphia, PA) as a landscape plant, and specifically a shade tree valued for its form and adaptability. Although seed became available from Europe not long after this initial introduction, plants were first offered for sale in North America 1762. Being relatively fast growing, adaptable to urban conditions, and generally pest-resistant, Norway maple was widely planted during the 1970s and 1980s as a replacement for American elm trees lost to Dutch elm disease and is still commonly planted in contemporary landscapes. The species has subsequently escaped cultivation and become naturalized in forested areas throughout much of the northeastern United States and southeastern Canada and in scattered locations in the Upper Midwest (including Minnesota) and in the northwestern United States and southwestern Canada (British Columbia).

Detailed Botanical Description: Norway maple is a medium-sized shade tree with a broad, rounded crown and opposite, simple, 5-7-lobed leaves. The leaves are typically 4-7 inches long and wide and bright to dark green in color, sometimes maroon/burgundy colored or variegated, with five sharply-pointed lobes and a nearly round outline. The stems, which have an opposite branching habit, are stout, light brown to olive-brown and becoming gray-brown to gray with shallow furrows with age. The root system is shallow and roots are typically visible at the soil line. Fall color is late to develop and often does not develop fully or at all before the leaves are killed by frost; when fall color does develop it is typically yellow, golden yellow, or orange yellow to purplish-red with a yellow ground for the red-leaved cultivars. Reports on the reproductive biology of Norway maple are mixed; the individual flowers are variously described as unisexual (male or female or functionally male or female on separate plants or the same plant; plants dioecious or monecious) or perfect (plants monecious); e.g., Michael Dirr says perfect (plants monecious), Munger says the species is dioecious. Regardless of the reproductive biology involved, the flowers are small (but bigger than most other maples), greenish-yellow, sweetly fragrant, and produced before the leaves on long stalks (pedicels) in erect, many-flowered, showy, stalked (peduncles) clusters (corymbs) in late April or May. The flowers are insect pollinated and are attractive to bees and other insects. The fruit is a double, winged samara (a dry, indehiscent, winged, 1-seeded fruit; a winged schizocarp); the fused samaras are borne on pendulous stalks (peduncles) with their wings oriented almost horizontally; the fruits are green or green and purple when young, becoming tan as they

mature (September-October). Norway maple might be confused with sugar maple (*Acer saccharum*), and grows on similar sites as an escape, but can be easily differentiated from sugar maple and other maples by the milky sap released from leaves, petioles, and young twigs when cut (this characteristic becomes less obvious later in the growing season), the larger, upright-oriented, and more showy flowers of Norway maple compared to the smaller, more delicate, and pendulous flowers of sugar maples, and differences in leaf shape. The buds of Norway maple are also large and rounded with fleshy, green to maroon-green or purple-green scales, while the buds of sugar maple are distinctly conical and pointed and brown to reddish-brown in color. The wings of the double samaras of sugar maple are also oriented vertically instead of horizontally.

Seed Dispersal & Germination: The fruit is a double, winged samara that ripens in the fall (September and October) and is dispersed by wind (and perhaps water). The seeds are in a state of deep dormancy when mature and cold stratification for 2-3 months is required to overcome dormancy; the exposure to cool, moist conditions required to overcome dormancy occurs naturally during the winter outdoors (including for seeds planted in the fall in outdoor seedbeds) and can be provided artificially in preparation for indoor planting or spring planting outdoors.

Economic Uses/Benefits: As a result of its popularity and adaptability, Norway maple has been widely planted as a shade tree on boulevards and in residential and commercial landscapes for many years and continues to be grown and planted today; although not preferred, Norway maple is generally tolerant of urban conditions once established including drought, deicing salt, compacted soils, and air pollution. In Europe, Norway maple has been used for veneer and in the production of a variety of specialty items including tool handles, gun stocks, and violins.

Human Health Impact: The pollen is considered moderately allergenic, the same as red (*Acer rubrum*), sugar (*Acer saccharum*), and silver maple (*Acer saccharinum*), but not as allergenic as boxelder (considered severely allergenic).

Current Regulation: Norway maple is not currently regulated in Minnesota or by the federal government; it is regulated as an invasive species in three states – Massachusetts (Prohibited), New Hampshire (Prohibited), and Vermont (Class B Noxious Weed); Norway maple is also listed (but not regulated) as an invasive species in Connecticut and New York and is recognized as an invasive species in other northeastern states and several Canadian provinces.

Box	Question	Answer	Outcome
1	The plant species or genotype is non-native.	Yes; Norway maple is native to central and eastern Europe and western Asia; Norway maple was one of the first species to be introduced to North America by European settlers and the first documented introduction was by John Bartram in Philadelphia in 1756 and plants were first offered for sale in 1762; interestingly, George Washington ordered two trees from John Bartram in 1792; because the only documented introductions, including Bartram's, were from Great Britain (where Norway maple is also not	Go to Box 3

		native), the geographic heritage of the early introductions is unknown (Nowak and Rowntree, 1990); the earliest record of Norway maple being sold in western North America was in Napa, California, in 1861 (Nowak and Rowntree, 1990).	
2	The plant poses significant human or livestock health concerns or has the potential to significantly harm agricultural production.		
	A. Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?		
	B. Does the plant cause significant financial losses associated with decreased yields, reduced quality, or increased production costs?		
3	The plant, or a related species, is documented as being a problem elsewhere.	Yes; Norway maple has been widely planted as a shade tree on boulevards and in residential and commercial landscapes over a period of more than 200 years and has subsequently escaped cultivation and invaded woodland ecosystems in some areas outside its native range, especially urban and suburban woodlands (Rhoads and Block, 2011; Martin, 1999); it has become naturalized in Great Britain (Nowak and Rowntree, 1990) and in portions of North America (mainly in the northeastern United States and southeastern Canada (Munger, 2003; Webb, et al., 2000; Ontario Invasive Plant Council (OIPC), https://www.ontarioinvasiveplants.ca; USDA, NRCS – The PLANTS Database, 2017, https://plants.usda.gov/core/profile?symbol=BASC5; and EDDMapS, 2017, http://www.eddmaps.org/distribution/uscounty.cfm?sub=19886 – most commonly reported in the northeastern United States/New England; see Appendix, Figures 1-7, for maps). Norway maple is listed as an invasive species or noxious weed and regulated in the United States in Massachusetts	Go to Box 6

		(Prohibited; Massachusetts Department of Agricultural Resources, 2017), New Hampshire (Prohibited; New Hampshire Department of Agriculture, Markets, & Food, 2017), and Vermont (Class B Noxious Weed; Vermont Agency of Agriculture Food & Markets, 2012); Norway maple it is also advised as an “invasive species” in New York (New York State Department of Environmental Conservation, 2013), listed as “invasive,” but not regulated, in Connecticut (Connecticut Invasive Plant Working Group, 2014), has received a “high” invasive ranking in Indiana (Clements, et al., 2012), and is considered a “moderately invasive species” in some areas in Virginia (Niemiera, 2009); Norway maple has also been recognized as an invasive species in several other states in New England, but is not regulated. The invasive potential of Norway maple has been attributed to many factors including its adaptability to a variety of soils (including compacted soils), shade tolerance, general pest resistance, efficient use of resources, salt and pollution tolerance, and a better ability to resist ice and snow damage (Bertin et al., 2005; Huebner et al., 2006; Kloeppel and Abrams, 1995; Munger, 2003; Nowak and Rowntree, 1990); larger seed size and reduced seed predation compared to its primary cogener in North American ecosystems (sugar maple) have also been suggested as competitive advantages (Meiners, 2005).	
4	The plants’ life history & growth requirements are sufficiently understood.		
5	Gather and evaluate further information.	(Comments/Notes)	
6	The plant has the capacity to establish and survive in Minnesota.		
	A. Is the plant, or a close relative, currently established in Minnesota?	Yes; Norway maple cultivars are commonly grown for sale and planted as boulevard and shade trees in Minnesota	Go to Box 7

		landscapes and throughout much of the northeastern United States and southern Canada; it has also been planted to a lesser extent in other parts of the United States; Norway maple has also been documented as a species that has escaped cultivation in the northeastern and north-central United States from Maine south to North Carolina and west to Minnesota, Wisconsin, Illinois, Kentucky, and Tennessee; it has also been reported as an escape in the northwestern United States in Washington, Oregon, Idaho, Utah, and Montana, and in Canada in the provinces of Nova Scotia, New Brunswick, Prince Edward Island, Quebec, Ontario, and British Columbia (USDA, NRCS – The PLANTS Database, 2018, https://plants.usda.gov/core/profile?symbol=ACPL, and EDDMapS, 2018, http://www.eddmaps.org/distribution/uscounty.cfm?sub=3002 – 34 (county data) or 26 (point data) reports statewide in Minnesota (11 or 12 of these reports are in Lake County and at least two of the reports appear to be trees growing in designed landscapes based on pictures); see Appendix, Figures 1-7, for maps). Minnesota is on the northwestern fringe of the projected range of Norway maple in eastern North America with far southern Minnesota and a strip along the north shore of Lake Superior potentially being the most suitable areas of the state (Nowak and Rowntree, 1990); climate change could play a future role, but no specific references have been found.	
	B. Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?		
7	The plant has the potential to reproduce and spread in Minnesota?		

	A. Does the plant reproduce by asexual/vegetative means?	No; On its own, Norway maple only reproduces by seed (Munger, 2003; Clements, 2012); when cut back, coppicing (multiple stems produced from the cut stump) does occur, but this response does not produce new plants or facilitate spread (Munger, 2003); the named cultivars are commercially propagated by grafting (primarily T-budding and sometimes chip budding), summer-softwood stem cuttings (increasingly, but with variable success), and sometimes tissue culture (Dirr and Heuser, 1987; James Calkins - personal experience).	Go to Question C
	B. Are the asexual propagules – vegetative parts having the capacity to develop into new plants – effectively dispersed to new areas?		
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes; Norway maple plants produce fairly large numbers of viable, cold hardy seeds (over 2,000 seeds/plant under favorable conditions; USDA Forest Service, 2005) and can reseed in Minnesota since naturalized plants have been reported in the state (EDDMapS, 2018) and have been observed by the author of this risk assessment (James Calkins); research has documented differences in seed production among cultivars and that several named cultivars produce significantly less seed, often with reduced viability, compared to the species and selecting and planting such cultivars has been suggested as a way to reduce invasiveness (Conklin and Sellmer, 2009a & b). Norway maple is typically reliably hardy in USDA Cold Hardiness Zones 4-7b; the cultivars vary in cold hardiness with a few being cold hardy to Zone 3; performance in zones warmer than Zone 7 is poor (Dirr, 1990); although the seedlings can be less hardy than established plants (Munger, 2003), they can survive in at least the warmer regions of Minnesota as evidenced by seed-derived individuals in the state (e.g., the Twin Cities area).	Go to Question F

		Norway maple seeds have strong internal dormancy and cold stratification for 2-3 months is required for germination (Dirr and Heuser, 1987; Pinfield et al., 1974)	
	D. If this species produces low numbers of viable seeds, does it have a high level of seed/seedling vigor or do the seeds remain viable for an extended period?	<i>No; Like the seeds of most maples, Norway maple seeds are reportedly short-lived in the soil (1 year) and most seeds germinate the spring after they were produced and disseminated from the parent tree (Young and Young, 1992; James Calkins – personal experience); as a result, Norway maple does not develop a significant seed bank; as referenced elsewhere in this assessment, Norway maple does, however, produce a significant and persistent seedling bank that persist for decades until the conditions become conducive for more rapid growth (i.e., gaps in the forest canopy) (Martin and Canham, 2010; Martin, 1999).</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment.
	E. Is this species self-fertile?	<i>No; Although literature reports that address the reproductive biology of Norway maple are quite variable and seem contradictory resulting in confusion, likely as a result of the complex and highly variable reproductive biology of the species, Norway maple is self-incompatible by virtue of being monocious with dichogamous, duodichogamous, or heterodichogamous flowering (male and female flower parts variously mature at different times resulting in plants that are functionally unisexual) and does not produce seed as a result of self-pollination (Renner et al., 2007; Rosado et al., 2018; Steve McNamara/University of Minnesota, Department of Horticultural Science, Horticultural Research Center (HRC) – personal communication).</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment.
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes; The double samaras rotate like helicopter blades as they fall and are dispersed by wind (and possibly water) (New Hampshire Department of Agriculture, Markets, & Food, 2014a; Young and Young, 1992); on average, it has been estimated that the seeds of Norway maple move	Go to Question I

		laterally 50.3 meters (165 feet) with a 10 km/hour (6.2 miles/hour) breeze when dropped from trees approaching the mature height for the species (Matlack, 1987; based on the context, it appears these were trees growing in the open), but a statement that this distance is not considered a long distance is included in the Indiana Norway maple invasive species assessment (Clements et al., 2012); dispersal distances up to several hundred meters have also been suggested (Bertin et.al., 2005); the dispersal distance in closed-canopy forests has been reported to be a “local process” and considerably less than these estimates with the majority of the seeds falling directly beneath or near the crown of the parent tree with an average maximum dispersal distance of 13-15 meters (43-49 feet) from the parent tree which has been suggested as a limiting factor for invasiveness in such environments (Martin and Cunham, 2010). Based on research designed to characterize the invasion of Norway maple on Mackinac Island, Michigan, it has been suggested that roads may be involved in the long-distance transport of seeds that hitchhike on vehicles and that such rare, long-distance dispersals and gap dynamics may be important factors in Norway maple invasions of relatively undisturbed forests (Wangen and Webster, 2006).	
	G. Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?	<i>No; Seven species of maple are native to Minnesota including Acer x fremanii (Freeman maple; a naturally-occurring hybrid between silver and red maple), Acer negundo (boxelder), Acer nigrum (black maple), Acer rubrum (red maple), Acer saccharinum (silver maple), Acer saccharum (sugar maple), and Acer spicatum (mountain maple), and a number of other introduced species of maple are occasionally grown in the state, but none are capable of hybridizing naturally with Norway maple because their genetics are not compatible</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment

		(supporting information: Wikipedia – List of Maple Species (with Section and Series classifications; https://en.wikipedia.org/wiki/List_of_Acer_species) and the UBC Botanical Garden Maple Hybridization Forum, (http://forums.botanicalgarden.ubc.ca/threads/maple-hybridization.42898/)).	
	H. If the plant is woody (trees, shrubs, and woody vines), is the juvenile period less than or equal to 5 years for tree species or 3 years for shrubs and vines?	<i>No; Norway maples can live to be 200-250 years old and matures later than most other maples and the juvenile period for Norway maple is more than five years and has been reported to remain pre-reproductive for 25-30 years for open-grown trees and 30-40 years in forested environments (Dirr and Heuser, 1987; Bertin et al., 2005; Wangen and Webster, 2006; James Calkins - personal experience); this extended juvenile phase contributes to a long lag period before potential infestations begin to expand.</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment
	I. Do natural controls exist, species native to Minnesota, which are documented to effectively prevent the spread of the plant in question?	No; apparently not; no information found.	Go to Box 8
8	The plant poses significant human or livestock concerns or has the potential to significantly harm agricultural production, native ecosystems, or managed landscapes.		
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	No; Other than the pollen being allergenic to some people, no information suggesting Norway maple is toxic to livestock, wildlife, pets, or people has been found. Norway maple pollen is considered moderately allergenic, but no more than native red, sugar, and silver maples and less than boxelder (considered severely allergenic) (PollenLibrary.com). Other maples can be toxic to horses; specifically, red maple (<i>Acer rubrum</i>), boxelder (<i>Acer negundo</i>), and	Go to Question B

		sycamore maple (<i>Acer pseudoplatanus</i>) are toxic to horses; subsequent research also suggests that sugar maple (<i>Acer saccharum</i>) and silver maple (<i>Acer saccharinum</i>) contain the same toxin and may also be toxic to horses; wilted or dry leaves are typically the most toxic, but other parts of these plants also contain the toxin including seeds; Norway maple does not appear to be a concern (Cornell University, 2015; Ragone, 2015; Valberg et al., 2012). Although the sugar content of the sap is slightly less than for sugar maple, Norway maples can be taped to produce maple syrup (North American Maple Syrup Producers Manual). The seeds of Norway maple are eaten by black bears, raccoons, squirrels, eastern chipmunks, white-footed mice, and meadow voles and leaves and twigs are browsed by white-tailed deer and cottontail rabbits (Hilty, 2017).	
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	No; Norway maple does not invade agronomic or horticultural agriculture and does not pose a threat to such production systems (James Calkins – personal experience), but it may be possible that forest infestations could pose a threat to the forestry industry although specific information pertaining to potential losses other than the displacement of sugar maple and other forest species has not been found; most forest effects tend to be described from an environmental perspective (reduced species diversity, etc.).	Go to Question C
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Yes; Norway maple can invade woodlands and mesic woodlands have been the most affected (especially urban woodlands in the Northeastern United States) – the same areas that support sugar maple and this is where Norway maple is most commonly found as an invader (Bertin et al., 2005); the dense shade produced by Norway maple shades out native vegetation and can reduce native species diversity for both herbaceous and woody species and even	Go to Box 9

		its own seedlings (Munger, 2003; Martin, 1999; Clements et al., 2012; Rhoads and Block, 2011; Martin and Canham, 2010; Invasive Plant Atlas of New England, 2017; Invasive.org); Norway maple seedlings are very shade tolerant and can invade established woodlands (more shade tolerant than sugar maple seedlings, but Norway maples become less shade tolerant with age); large populations of shade tolerant Norway maple seedlings can persist in the understory for decades (30 years or more) until disturbance creates canopy openings (Bertin et al., 2005; Wangen and Webster, 2006); specific to completion with sugar maple, research indicates that Norway maple utilizes light, water and nutrients, including nitrogen and phosphorus, more efficiently than sugar maple (Kloeppel and Abrams, 1995; Niinemets, 1998, Munger, 2003); allelopathy has been suggested, but formal documentation has not been found (Galbraith-Kent and Handel, 2008; City of Toronto Urban Forestry, 2013; New Hampshire Department of Agriculture, Markets, & Food, 2014) and this theory has also been questioned (Rich, 2004; shade may be the primary factor); infestations are initially most common on disturbed sites and near seed sources (Bertin et al., 2005); roads and trails appear to be involved in seed dispersal (Wangen and Webster, 2006).	
	D. Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?		
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?	<i>Yes; primarily a concern in mesic woodland ecosystems where Norway maple outcompetes and shades out native species (Bertin et al., 2004). Norway maple has invaded mixed-deciduous forests in riparian bottomlands, coniferous forests in Montana and Idaho, and deciduous forests throughout the northeastern United States and</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment.

		<i>eastern Canada (Reinhart et al., 2006; Nowak and Rowntree, 1990); riparian areas are often sites of invasion and virtual monocultures of Norway maple can sometimes develop in floodplain areas (Reinhart et al., 2006).</i> <i>Norway maple can increase nutrient cycling rates (N, Ca), pH, and nutrient availability (Ca, K, Mg, N) and these effects can modify the competitive hierarchies in forest ecosystems (Clements et al., 2012).</i>	
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?	<i>Verticillium wilt is perhaps the most serious pest, but other maples are also susceptible (Keykhasaber et al., 2018); young Norway maple trees are also susceptible to powdery mildew caused by Sawadaea tulasnei which is native to Europe, but this pathogen is also widely distributed in North America (Sucharzewska, 2010).</i> <i>Norway maple, as for maples in general, is a preferred host of Asian long-horned beetle (Anoplophora glabripennis), a non-native species that is present in several locations in eastern North America, but is not yet present in Minnesota (Clements et al., 2012; The Nature Conservancy, 2010).</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment.
9	The plant has clearly defined benefits that outweigh associated negative impacts.		
	A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?	Yes; Norway maple is currently grown and sold in Minnesota and is commonly planted on boulevards and in designed landscapes in Minnesota and neighboring states as it has been for many years (James Calkins – personal experience); although they are not all widely available, over 100 named cultivars have been selected based on size, form (columnar to weeping), foliage characteristics including leaf color (various shades of green and maroon/maroon-green and variegated) and leaf shape (variously 5-lobed to deeply dissected); the cultivars are	Go to Question B

		propagated by grafting (specifically, budding; grafted on seedling rootstocks); seeds are readily available and sold online through Amazon.com and other sources. Based on the responses to a nursery industry survey conducted by the Minnesota Department of Agriculture in partnership with the Minnesota Nursery and Landscape Association in November, 2017, 38% of the respondents sell Norway maple and 22% say Norway maple provides significant income and that regulation would have a negative impact on their business (Minnesota Department of Agriculture, 2017). In 2018, the Minnesota Nursery and Landscape Association reached out to nursery wholesalers in an attempt to get an estimate of the wholesale value of Norway maple to the Minnesota nursery and landscape industry and in Minnesota landscapes (James Calkins, Minnesota Nursery and Landscape Association; personal communication, August 22, 2018). It is important to note that wholesale value does not represent the full value of a particular species because retail value is not accounted for and is a significant component of the value equation. For Norway maple (<i>Acer platanoides</i>; including the species and all cultivars; there are many named cultivars) the estimated value of Norway maple to Minnesota wholesalers is well over \$1,000,000/year and the estimated wholesale value based on Minnesota sales is \$303,426/year (about 2.0% of total annual sales for these growers). As a wholesale value based on only the biggest wholesalers of this species, although these growers probably account for the majority of the wholesale production of Norway maple in Minnesota, this estimate of wholesale value is not representative of every grower and is, therefore, a rough and conservative estimate of the wholesale value. The	
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		value of Norway maple to these wholesale growers is also much higher when out-state sales are considered. Multiplying the wholesale value by a factor of 1.5 to 2.0 would probably provide a rough, but reasonable, estimate of the ultimate retail value of the Norway maple plants sold by these wholesalers. Based on this information the estimated value (wholesale plus value-added retail) of Norway maple plants sold in Minnesota would be in the range of \$758,565 to \$907,278/year (once again, this would be a conservative estimate because the data set is not complete). These estimated monetary values also do not account for the unique landscape value of Norway maple in designed landscapes. A more targeted and extensive survey of the value of Norway maple to Minnesota growers, retailers, and landscape professionals was initiated in August 2018 and was not complete when the deadline for submitting the risk assessment arrived. This information will be added to the risk assessment at a later date. Examples of some of the most common cultivars of Norway maple include 'Cleveland', 'Columnarbrood' (Parkway®), 'Columnare', 'Conzam' (Conquest™), 'Crimson King', 'Crimson Sentry', 'Deborah', 'Drummondii', 'Fairview', 'Globosum', 'McGill No.42' (Emerald Queen®), 'Pond' (Emerald Luster®), 'Princeton Gold', and 'Royal Red', 'Schwedleri', 'Summershade', 'Superform', and 'Variegatum' (based on wholesale nursery catalog listings in 2017; Bachman's Wholesale, Bailey Nurseries, J. Frank Schmidt & Son, Carlton Plants, and others); the cultivars with maroon foliage are unique and are some of the most popular and most widely planted selections.	
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		Utah State University Forestry Extension says Norway maple is a good tree based on its good form, foliage color, and adaptability, but also states that it has been over-planted in parts of Utah (Utah State University Extension – Forestry, 2016). Norway maple is native to central and eastern Europe and western Asia and is not native to Minnesota.	
	B. 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?	Yes; Norway maple can be effectively controlled by pulling seedlings saplings, and with selected herbicides including tryclopyr and glyphosate (The Nature Conservancy, 2010 & 2016; Cygan, 2014; Rhoads and Block, 2011); given the long lag period before seed production commences, cutting can reduce seed production for many years (canopy openings can, however, release light-deprived seedlings) and may enable invasion by other invasive species (Webb et al., 2001; Rogers, 2013; New Hampshire Department of Agriculture, Markets, & Food, 2014a). It has been observed that Norway maple cultivars differ in seed production and viability; of the cultivars studied ‘Columnare’ and ‘Emerald Queen’ produced many seeds while ‘Crimson King’, ‘Globosum’, ‘Faasen's Black’, and ‘Rubrum’ produced relatively low numbers of seeds (<10% of what is typically produced by the species) and may be better selections for landscape use where invasiveness is a concern (Conklin and Sellmer, 2009a & 2009b); it has been argued, however, that because the cultivars of Norway maple are grafted (budded) onto seedling rootstocks, the benefit of cultivars that have lower fecundity could be lost if the scion dies and is replaced by the rootstock (Clements et al., 2012); increased success in propagating cultivars from cuttings (Dirr and Heuser, 1987) would eliminate this concern.	Go to Box 11

		Research has documented the ability of Norway maple to invade American beech/sugar maple/oak woodlands and it has been suggested that it may be necessary to restrict horticultural plantings of Norway maple and to remove mature Norway maples in the vicinity of nature preserves (i.e., woodlands) as a way of preventing the establishment of Norway maple populations in these areas (Webb and Kaunzinger, 1993; Webb et al., 2001).	
	C. Is the plant native to Minnesota?		
	D. Is a non-invasive, alternative plant material commercially available that could serve the same purpose as the plant of concern?	<i>There is interest in developing sterile varieties; the induction of polyploids using tissue culture techniques and mitotic spindle fiber inhibitors with the ultimate goal of developing sterile triploids with desirable landscape characteristics is an example (Lattier et al, 2013).</i>	This text is provided as additional information and is not part of the decision tree process for this risk assessment.
	E. Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?		
10	Enforce control as a noxious weed to prevent introduction &/or dispersal; designate as Prohibited or Restricted.		
	A. Is the plant currently established in Minnesota?		
	B. Does the plant pose a serious human health threat?		
	C. Can the plant be reliably eradicated (entire plant) or controlled (top growth only to prevent pollen dispersal and seed production as appropriate) on a statewide basis using existing practices and available resources?		
11	Allowed but controlled via a species-specific management plan; designate as Specially Regulated.		Recommendation – List Norway maple (and all fertile cultivars) as a Specially Regulated Plant and develop a

			species-specific management plan.
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Final Results of Risk Assessment		
Review Entity	Comments	Outcome
NWAC Listing Subcommittee	July 11, 2018	Recommended listing Norway maple (and all fertile cultivars) as a Specially Regulated Plant.
NWAC Full-Committee	Vote was 15:1 in favor on 12/19/18	Specially Regulated Sellers shall affix a label that advises “Norway maple should only be planted in areas where the seedlings will be controlled or eradicated by mowing or other means. Norway maple seed is wind dispersed so trees should not be planted closer than 100 yards from natural areas.”
MDA Commissioner	Commissioner order was signed on 03/03/19 and became effective on 01/01/20.	Specially Regulated with label requirement

Risk Assessment Summary (07/11/2018):

Norway maple was one of the first trees introduced to North America as a landscape plant and remains a popular shade tree that continues to be grown and planted in designed landscapes today. As a result of its adaptability and aesthetic characteristics, it has been widely planted outside its native range including in the northern United States and southern Canada in North America where it has been documented as an escape and become naturalized and problematic in native woodlands in some areas including in the northeastern, northcentral, and northwestern United States and southeastern and southwestern Canada. Escaped plants have been documented in landscapes and woodland areas in eastern Minnesota and northern Wisconsin.

Tentative Recommendation – As was previously determined for Amur maple (*Acer tataricum* ssp. *ginnala*), and for similar reasons (already widely planted, value as a landscape plant, and lack of a vector for long-distance seed dispersal), list Norway maple, including all named cultivars capable of producing viable seed, as a Specially Regulated Plant in Minnesota with the goal of retaining this species as an option for planting in developed areas and preventing its escape from cultivation and establishment in native woodlands. The long juvenile period (time to flowering and fruiting) for Norway maple (decades) provides additional support for this recommendation. Development of a species-specific management plan will be required and should probably specify where Norway maple may and may not be planted and the education of forest

managers about the potential for Norway maple to escape cultivation and the identification of Norway maple seedlings. A requirement that Norway maples offered for sale carry a label suggesting that they should only be planted in locations where seedlings would be controlled by normal landscape maintenance activities and a minimum distance from natural woodlands, as is the case for Amur maple, and/or other, and possibly more restrictive regulatory requirements, could be a part of this management plan. Although the flowers of Norway maple are a fairly significant and valuable landscape characteristic, the fruits are not and research focused on the development of sterile cultivars may also have the potential to prevent the escape of Norway maple into natural areas through the development of seedless varieties and these efforts should be supported.

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Appendix

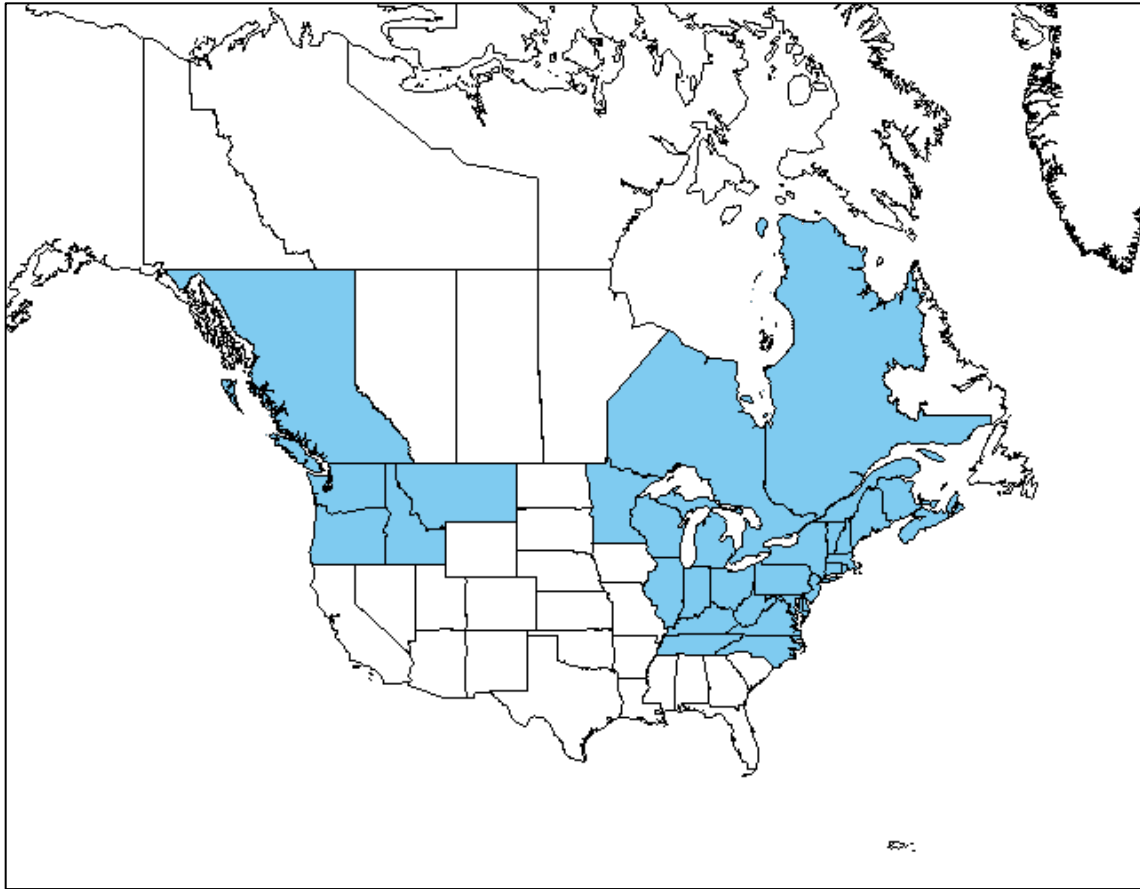


Figure 1. USDA, NRCS State Distribution / Norway Maple (*Acer platanoides*); Map downloaded on April 8, 2018; <https://plants.usda.gov/core/profile?symbol=ACPL>.

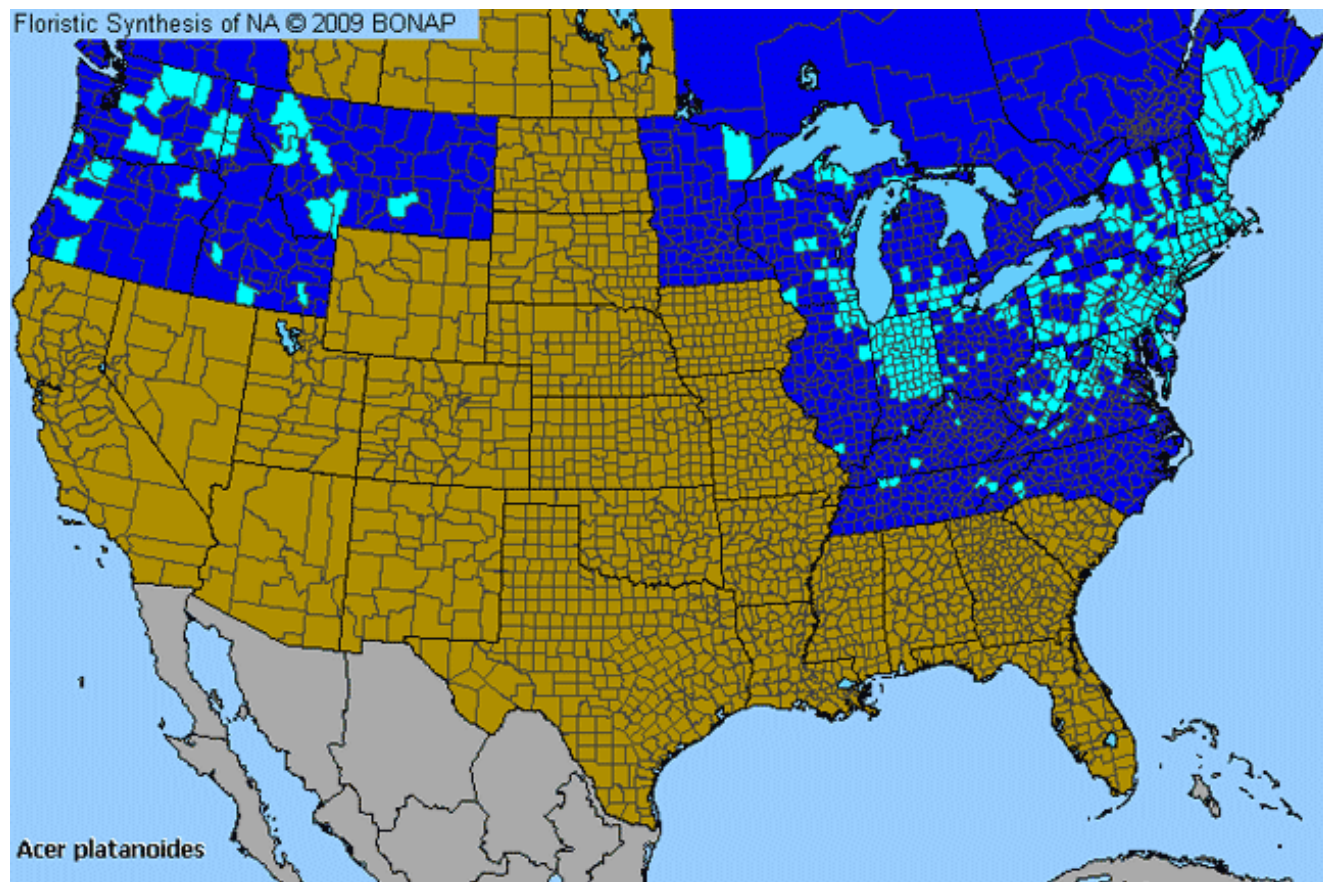


Figure 2. PollenLibrary.com State/County Distribution / Norway Maple (*Acer platanoides*); Map downloaded on April 8, 2018; <http://www.pollenlibrary.com/map.aspx?map=Acer-platanoides.png>.

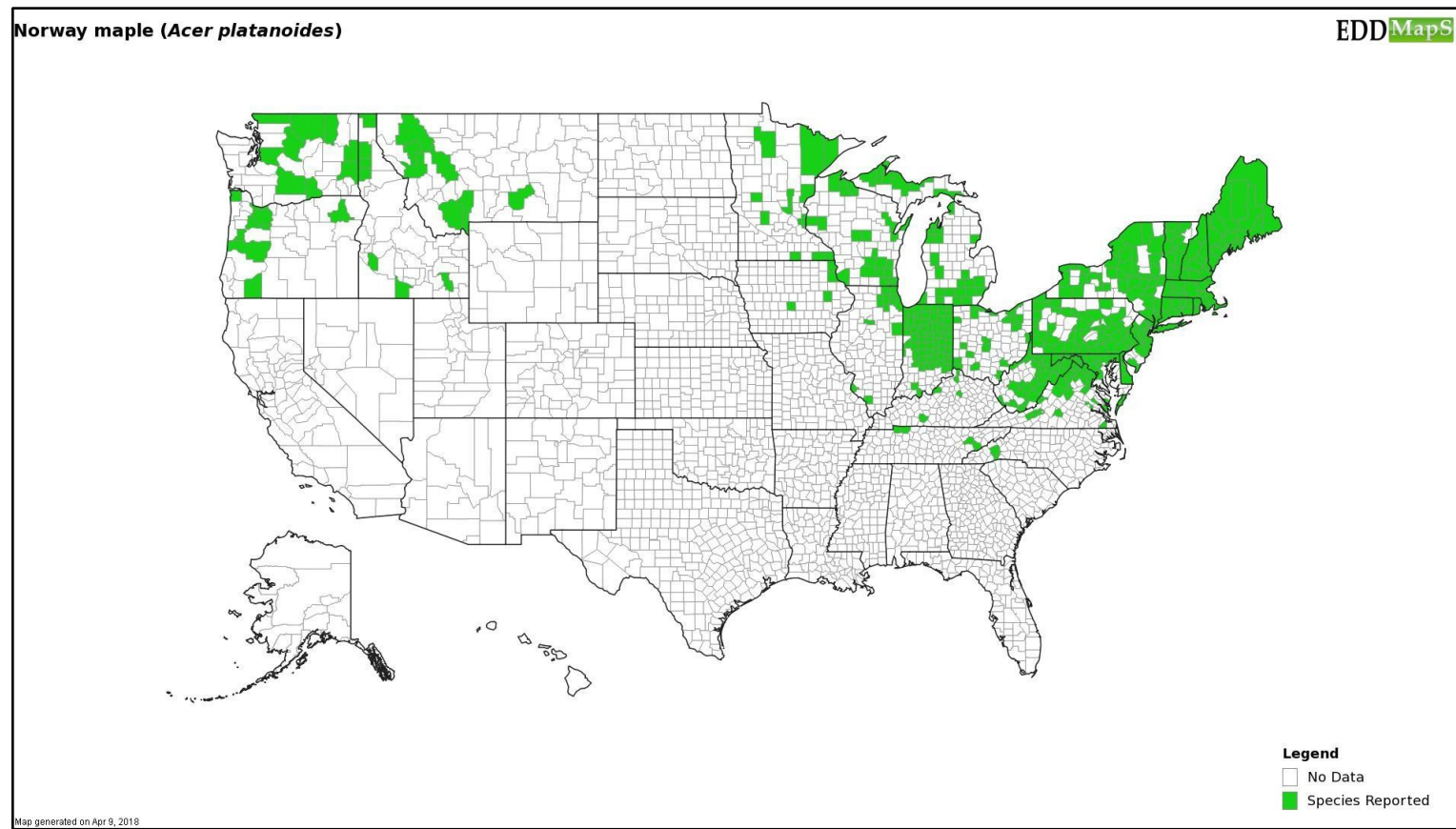


Figure 3. EDDMapS County Distribution / Norway Maple (*Acer platanoides*); Map downloaded on April 9, 2018;
<https://www.eddmaps.org/distribution/uscounty.cfm?sub=3002>.

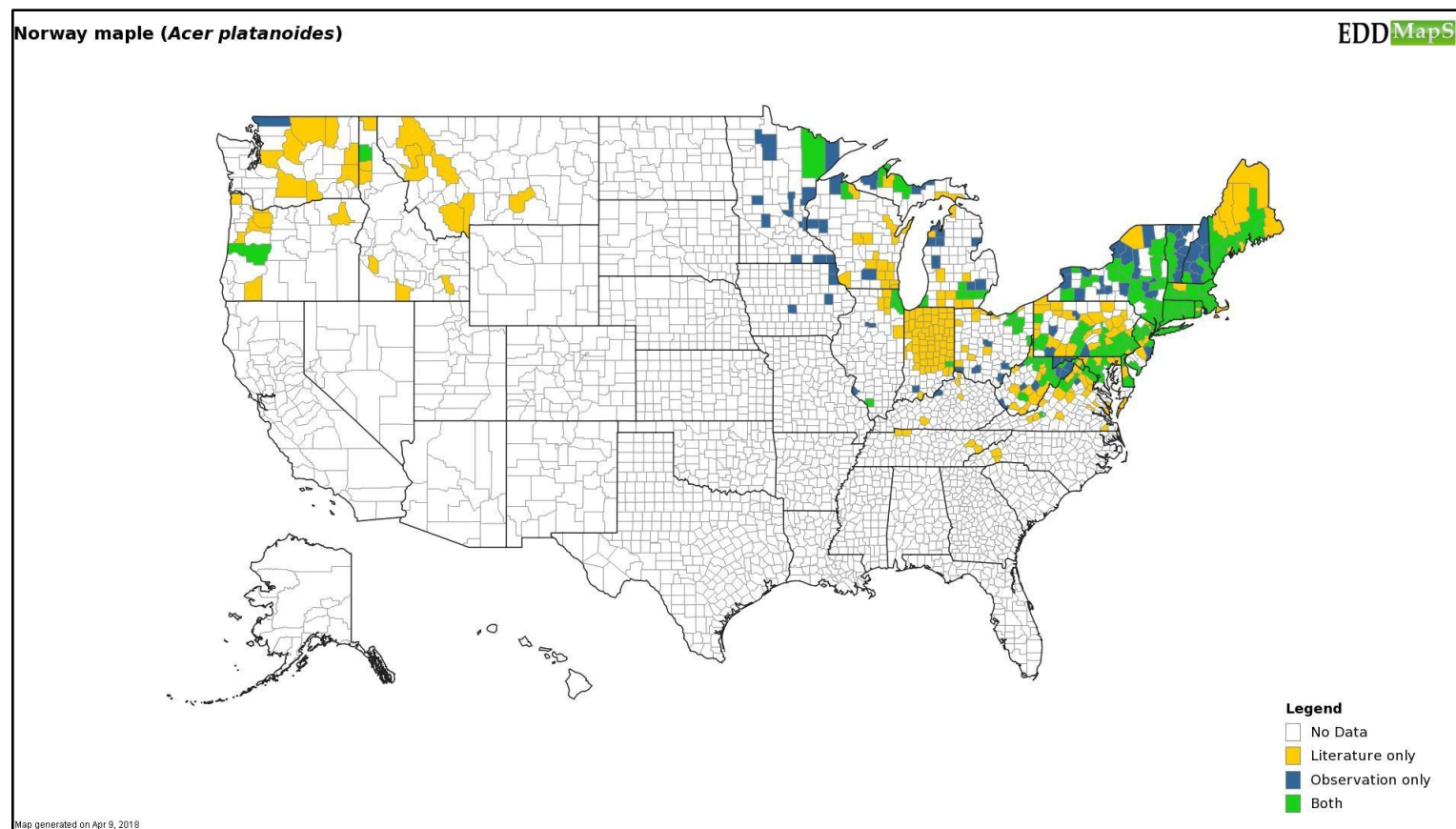


Figure 4. EDDMapS USA County Distribution/Literature vs. Observation / Norway Maple (*Acer platanoides*); Map downloaded on April 9, 2018; <https://www.eddmaps.org/distribution/uscounty.cfm?sub=3002&map=literature>.

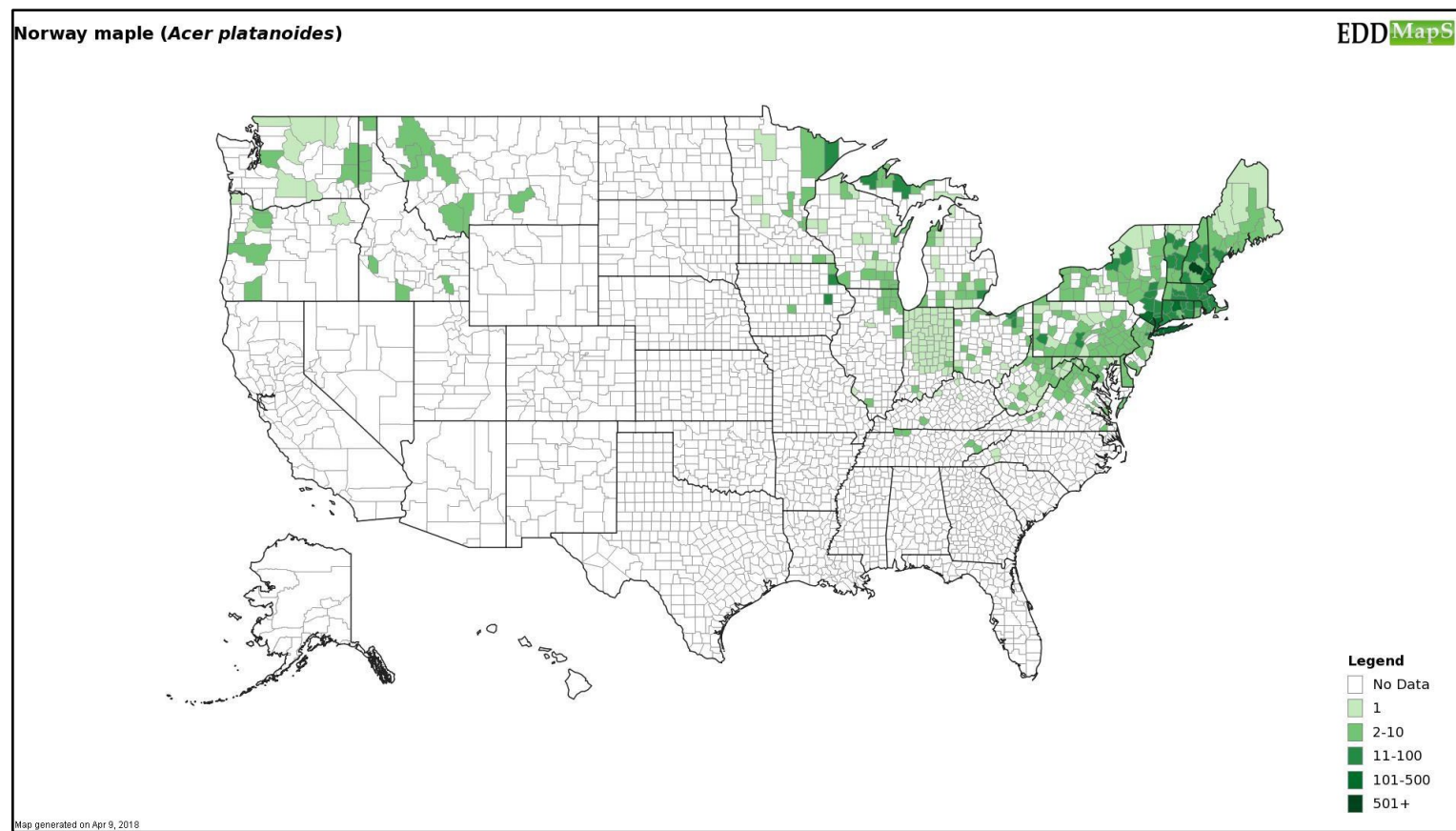


Figure 5. EDDMapS USA County Record Density / Norway Maple (*Acer platanoides*); Map downloaded on April 9, 2018; <https://www.eddmaps.org/distribution/uscounty.cfm?sub=3002&map=density>.

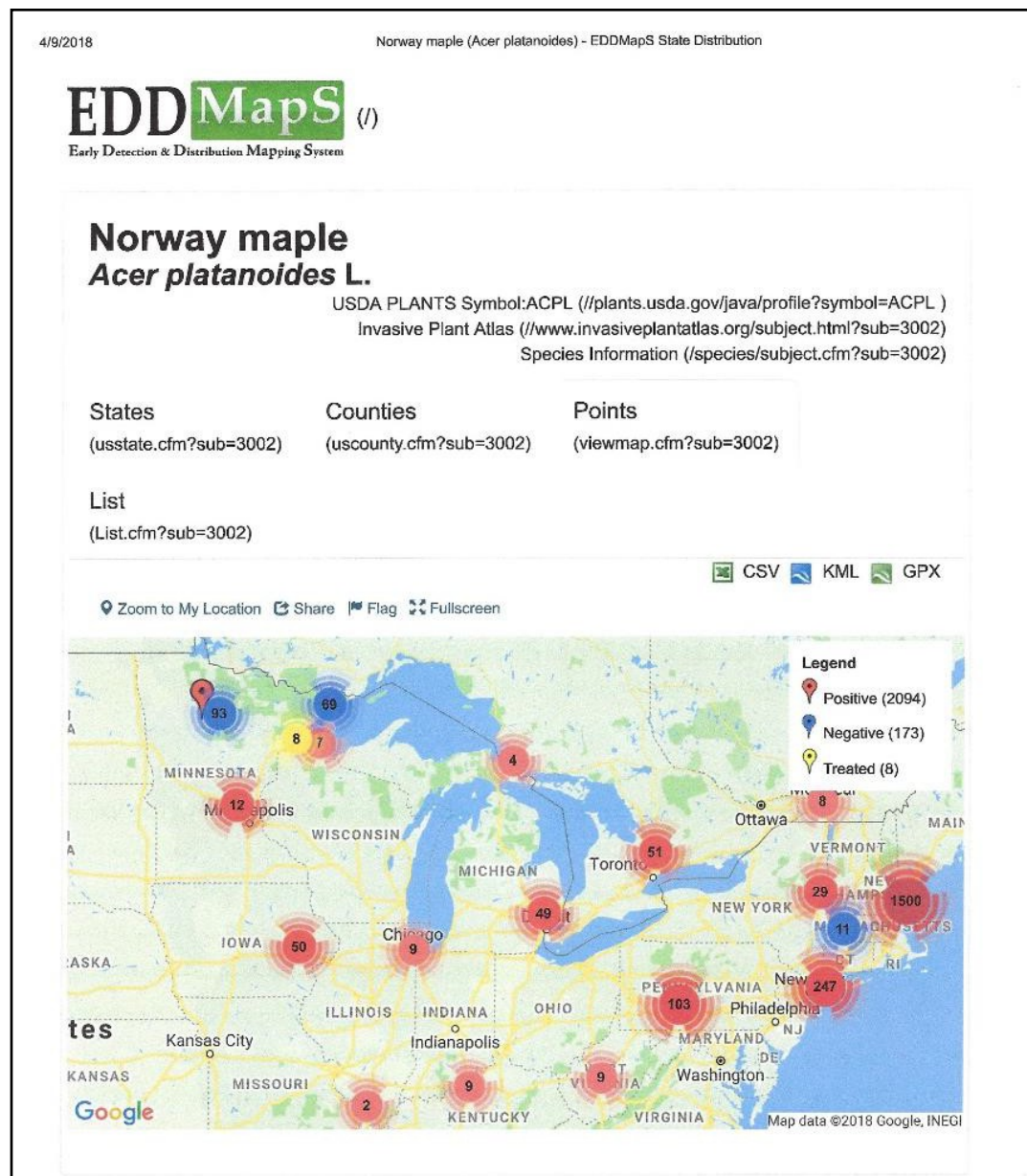


Figure 6. EDDMapS NE USA Points Distribution / Norway Maple (*Acer platanoides*); Map downloaded on April 9, 2018;
<https://www.eddmaps.org/distribution/viewmap.cfm?sub=3002>.

Norway maple *Acer platanoides* L.

USDA PLANTS Symbol: ACPL ([//plants.usda.gov/java/profile?symbol=ACPL](http://plants.usda.gov/java/profile?symbol=ACPL))

Invasive Plant Atlas ([//www.invasiveplantatlas.org/subject.html?sub=3002](http://www.invasiveplantatlas.org/subject.html?sub=3002))

Species Information ([/species/subject.cfm?sub=3002](http://species.subject.cfm?sub=3002))

States

(usstate.cfm?sub=3002)

Counties

(uscounty.cfm?sub=3002)

Points

(viewmap.cfm?sub=3002)

List

(List.cfm?sub=3002)

CSV KML GPX

Zoom to My Location Share Flag Fullscreen

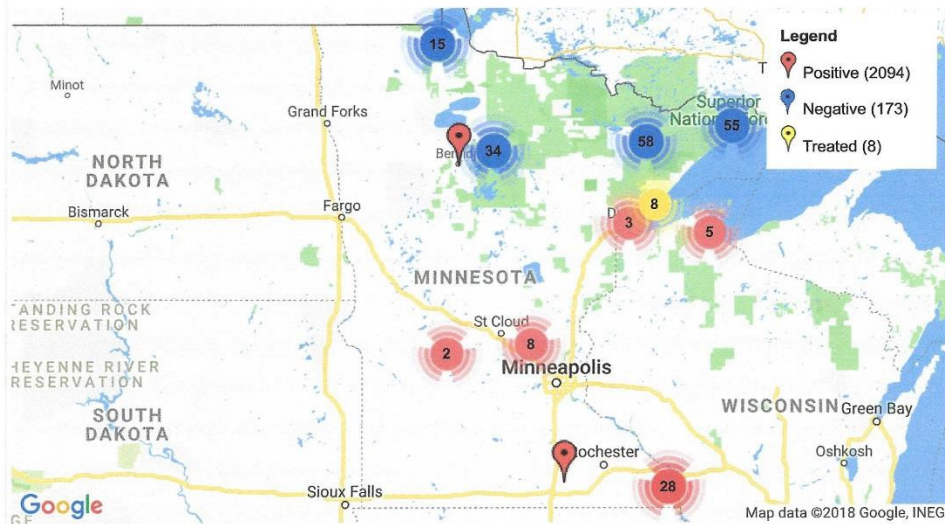


Figure 7. EDDMapS Minnesota Points Distribution / Norway Maple (*Acer platanoides*); Map downloaded on April 9, 2018; <https://www.eddmaps.org/distribution/viewmap.cfm?sub=3002>.

Additional images of volunteer Norway maple seedlings in urban woodlands and woodland gardens (James Calkins)





