

Ontario Species at Risk Evaluation Report

for

Blue Ash (*Fraxinus quadrangulata*)

Committee on the Status of Species at Risk in Ontario
(COSSARO)

Assessed by COSSARO as Threatened

January 2016

FINAL

Frêne bleu (*Fraxinus quadrangulata*)

Le frêne bleu (*Fraxinus quadrangulata*) est un arbre de taille moyenne de la famille de l'olivier qui peut atteindre une hauteur maximale de 20 m et posséder un tronc d'une circonférence de 80 cm en Ontario et qui peut vivre jusqu'à 200 ans. Il est pourvu de feuilles composées qui comptent généralement sept folioles, mais il se distingue facilement des autres espèces de frênes par ses petites branches à quatre angles munies d'ailerons subéreux. Le frêne bleu est monoïque, contrairement aux frênes qui sont dioïques. Il est confiné à cinq comtés dans l'extrême sud-ouest de l'Ontario, où il croît dans trois habitats différents : les alvars, les plages sablonneuses stabilisées et les riches plaines inondables alluviales. En tout, 56 occurrences d'éléments sont connues. Environ la moitié des sites connus ont fait l'objet d'un relevé. Ces sites contiennent approximativement 708 individus matures. Le nombre d'individus matures dans les autres endroits est inconnu, mais la population totale est presque certainement inférieure à 10 000 individus.

Le frêne bleu n'a pas donné de signes de diminutions importantes au cours des dernières décennies, mais il est vulnérable à deux grandes menaces, qui sont le broutage excessif par une population grandissante de cerfs de Virginie et l'agrile du frêne (*Agilus planipennis*), un coléoptère non indigène dont les larves s'enfouissent dans les frênes. Les cerfs empêcheraient certains sites de se régénérer. L'effet du cerf de Virginie sur le recrutement du frêne bleu n'est pas encore connu, mais il serait néfaste à l'heure actuelle. Le frêne bleu semble être beaucoup moins vulnérable à l'agrile du frêne que les autres espèces de frênes, malgré une plus grande incidence d'infestation dans certains emplacements, probablement en raison de la quasi-élimination d'autres frênes.

Le frêne bleu a été évalué par le CDSEPO comme une espèce menacée en Ontario en raison de la petite taille de sa population (moins de 10 000 individus matures) et de sa répartition très restreinte dans une zone d'occupation de seulement 272 km². Il a déjà été évalué comme une espèce préoccupante, mais une désignation plus élevée lui a été attribuée devant de nouvelles menaces. Certaines diminutions ont été documentées et devraient se poursuivre, ce qui rend cette espèce susceptible de disparaître.

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Executive summary

Blue Ash (*Fraxinus quadrangulata*) is a medium sized tree in the olive family that attains a maximum height of 20 m and a trunk circumference of 80 cm in Ontario and may live up to 200 years. It has compound leaves typically with seven leaflets but is readily told from other ash species by its four angled twigs with corky wings. Blue Ash is monoecious unlike other ashes that are dioecious. It is restricted to five counties in extreme southwestern Ontario where it grows in three different habitats: alvars, stabilized sand beaches, and rich alluvial floodplains. A total of 56 element occurrences are known. Approximately half of the known sites have been surveyed, and these contain approximately 708 mature individuals. The numbers of mature individuals at the remaining sites are unknown but the entire population is almost certainly less than 10,000.

Blue Ash has not shown significant declines in recent decades but is susceptible to two main threats which are over-browsing by an expanding White-tailed Deer population and the Emerald Ash Borer (*Agilus planipennis*), a non-native beetle whose larvae burrows into ash trees. Deer are believed to be preventing regeneration at some sites. The effect of White-tailed Deer on Blue Ash recruitment is unknown at this time but suspected to be detrimental. Blue Ash has been shown to be considerably less susceptible to Emerald Ash Borer than other ash species but recently it has shown a higher incidence of infestation at some locations, possibly due to the near elimination of other ashes.

Blue Ash has been assessed by COSSARO as Threatened in Ontario due to its small population (less than 10,000 mature individuals) and very restricted range with an area of occupancy of only 272 km². It was previously assessed as Special Concern but was given a higher designation due to new threats. Some declines have been documented and are expected to continue which makes this species vulnerable to extirpation.

1. Background information

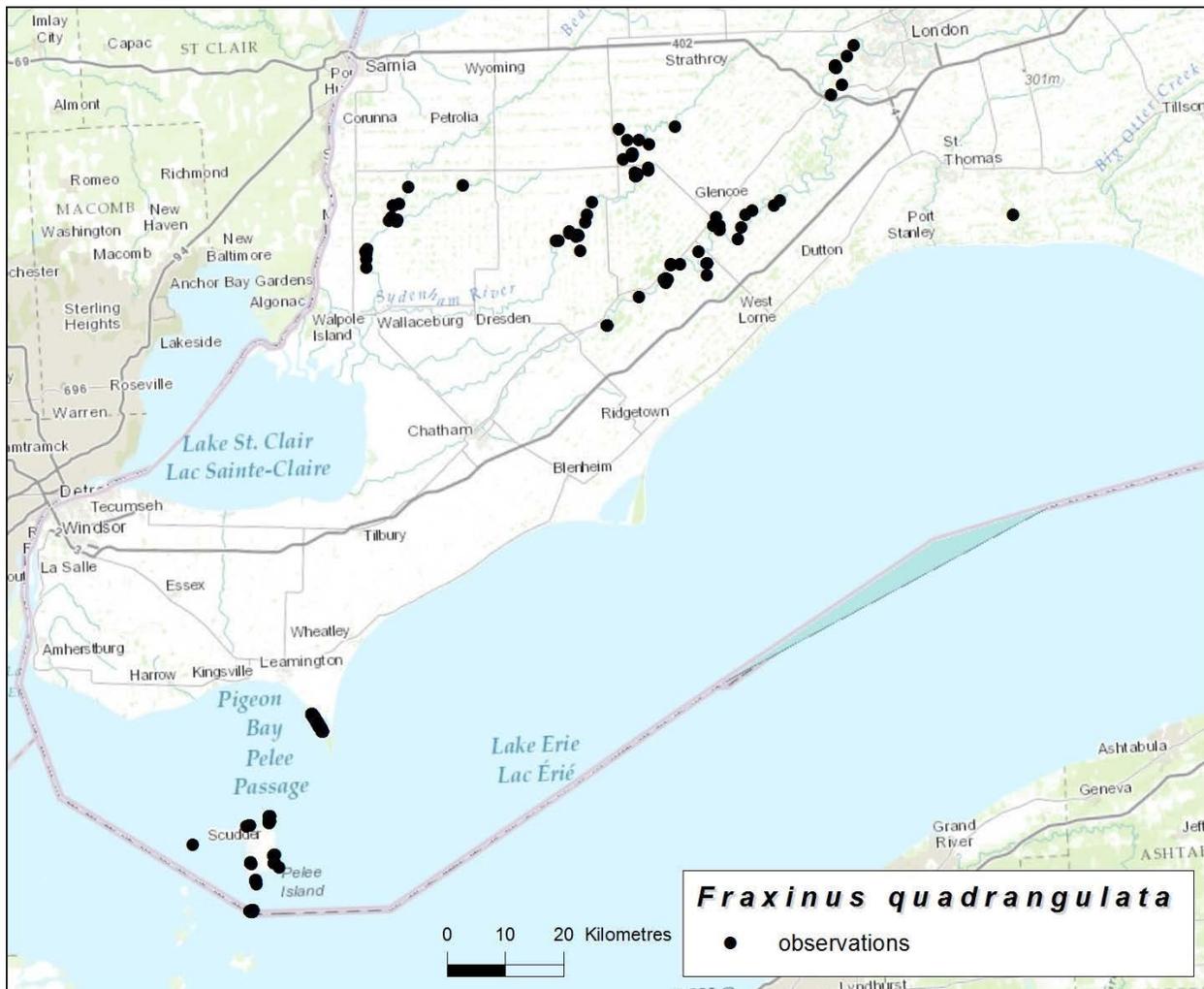
1.1. Current designations

- GRANK: G5 (NatureServe 2015)
- NRANK Canada: N3
- COSEWIC: Threatened (November 2014)
- SARA: Special Concern (Schedule 1)
- ESA 2007: Special Concern (2008)
- SRANK: S3

1.2. Distribution in Ontario

Blue Ash is confined to extreme southwestern Ontario in the Carolinian Zone (Figure 1). It is known to occur in the counties of Essex, Elgin, Middlesex, Lambton and Chatham-Kent. It is essentially confined to the floodplains of the Thames River, Sydenham River and Beaver Creeks, as well as to Point Pelee and the Erie Islands. A total of 56 element occurrences are known. The species has not disappeared from any sites in the past several decades. Estimated extent of occurrence (EOO) is 8884 km² and area of occurrence (AOO) is 272 km². The entire population in Ontario is believed to be no more than 2500 mature trees (COSEWIC 2014). According to COSEWIC's method of determining locations by threat, the number of locations for Blue Ash ranges from two to more than 10 locations, which is largely based on the uncertainty of the threat posed by Emerald Ash Borer and/or White-tailed Deer across the range.

Figure 1. Range of blue ash in Ontario from COSEWIC (2014).



1.3. Distribution and status outside Ontario

The species has a wide distribution in the Eastern United States west of the Appalachian Mountains. It occurs from southwestern Ontario and Ohio south to northern Georgia, west to Arkansas, extreme eastern Oklahoma and Wisconsin.

1.4. Ontario conservation responsibility

Ontario makes up a very small portion of Blue Ash's global range, probably about 1% and therefore has a small conservation responsibility.

1.5. Direct threats

COSEWIC (2014) has determined that the two greatest threats currently facing Blue Ash are over browsing by White-tailed deer (*Odocoileus virginianus*) and the invasive non-native Emerald Ash Borer (*Agilus planipennis*).

The actual impact of deer browsing on Blue Ash regeneration is not clear but suspected to be detrimental (COSEWIC 2014). White-tailed Deer have increased substantially over the last few decades through most of the tree's range, and they browse heavily on most woody plants including ashes (Waldron 2003), but it has not been proven that Blue Ash constitutes preferred browse or how serious the impacts of deer browsing are on Blue Ash seedling and sapling survival.

The Emerald Ash Borer (EAB) was first discovered in Canada in 2002 at Windsor. Since then it has spread rapidly resulting in the death of tens of millions of ash trees (OMNR 2013). The beetles have mainly affected White (*Fraxinus americana*), Green (*F. pennsylvanica*), Black (*F. nigra*) and Pumpkin Ash (*F. profunda*). Blue Ash has been much less affected and has a certain natural immunity to them (Campbell 2012, Tanis and McCullough 2012). During surveys in 2012 and 2013, EAB was found to be present at 46% of Blue Ash sites, yet only 5% of trees were affected at those sites and 0.58% have died. (COSEWIC 2015) Recently however, as the other ashes are largely gone, there is some evidence that Blue Ash is being more targeted. For example 34.5% of Blue Ashes at one site on Pelee Island, were affected by EAB. Most of affected trees were ones that were previously stressed or damaged. It was also found in Michigan that Blue Ash continued to thrive at some sites where other ashes were dead (Tanis and McCullough 2012), however at a few sites in western Ohio all Blue Ash were also dead from EAB (S. Miller, Ohio DNR pers comm. as cited in COSEWIC 2014). Since the fieldwork was conducted in 2013 for the COSEWIC (2014) report, there has been no apparent increase in Blue Ash mortality from EAB in Ontario populations (J. Ambrose pers. comm. 2015, O. Gard pers. comm. 2015, G. Waldron pers. comm. 2015).

Other threats include cattle grazing, fire suppression and damage by recreational vehicles. The population on Middle Island in Lake Erie has been heavily impacted by the large Double-crested Cormorant (*Phalacrocorax auritus*) nesting colony. Of 240 living Blue Ash (many others had died) recorded by a Parks Canada survey in 2012, 69% were severely to moderately impacted by cormorant feces (COSEWIC 2014).

Development and forest removal were not listed as a major threat by COSEWIC (2014). Blue Ash has a highly restricted range in a portion of Ontario where forest loss has been severe since European colonization. Over 90% of the forest has been lost in the counties where it occurs and it was likely much more widespread and abundant historically (Larson et al. 1999). Most of the remaining Blue Ash grow on either floodplains or in protected areas at Point Pelee and the Erie Islands which are areas where forest clearing is now minimal.

1.6. Specialized life history or habitat use characteristics

Blue Ash occurs on three different habitat types in Ontario: alvars, sand spits and rich alluvial floodplains. Its general biology is much like other ashes and therefore does not

have highly specialized life history characteristics but it is more drought-tolerant and climatically limited since it has a much more restricted range.

2. Eligibility for Ontario status assessment

2.1. Eligibility conditions

2.1.1. Taxonomic distinctness

Yes. Blue Ash is a distinct species clearly distinguishable from other species of ash.

2.1.2. Designatable units

No. Blue Ash is confined to a small area in the southwestern part of the province. There is a separation of the Point Pelee / Erie Islands populations and the next nearest to the northeast by about 75 km but the range was likely more continuous historically.

2.1.3. Native status

Yes. A native North American species, the Ontario range is contiguous with the more extensive U.S. range to the south.

2.1.4. Occurrence

Yes. Extant in Ontario.

2.2. Eligibility results

Blue Ash (*Fraxinus quadrangulata*) is eligible for status assessment in Ontario.

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Does not apply – There is no documented evidence of a significant population decline in the last three generations.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Does not apply – The EOO is 8884 km² and AOO is 272 km² and there are 5 threat locations according to COSEWIC (2014 p.viii). However, no subpopulations or element occurrences have been lost in recent decades. Although there is a projected decline in the number of individuals and quality of habitat due to Emerald Ash Borer and heavy browsing pressure by White-tailed Deer, there is no conclusive evidence for severe fragmentation, nor have there been extreme fluctuations in number of individuals or

range.

3.1.3. Criterion C – Small and declining number of mature individuals

Threatened C2a(i). COSEWIC (2014) provides a population estimate of approximately 2500 mature trees. This estimate may be conservative but it is unlikely the population is over 10,000 individuals and no site has more than 1000 individuals. A total of 708 mature trees were counted at 25 of the 56 known sites but these were not complete inventories. No sites have more than 1000 individuals. Some declines have been documented and are expected to continue due to Emerald Ash Borer and heavy browsing pressure by White-tailed Deer.

3.1.4. Criterion D – Very small or restricted total population

Does not apply. There are almost certainly more than 1000 mature individuals and the AOO is much greater than 20 km².

3.1.5. Criterion E – Quantitative analysis

Insufficient information. Population Viability Analysis has not been conducted on Blue Ash.

3.2. Application of Special Concern in Ontario

Does not apply

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

A very small portion (appears to be about 1%) of the global range of Blue Ash occurs in the province. Consequently Ontario has a low conservation responsibility for this species.

3.3.2. Rescue effect

There is potential for rescue of 3 of the 56 extant element occurrences (EOs). Blue Ash occurs on South Bass Island in Ohio which is only 12 km from Pelee Island and 10 km from Middle Island. Blue Ash seeds can be windblown or float on water and therefore it is possible that genetic exchange occurs between these areas. The sub-population in Bear Creek is only 10 km from the St. Clair River and US border. Blue Ash occurs in Macomb County on the west side of the St. Clair River in nearby Michigan (Voss and Reznicek 2012) and therefore some rescue effect is possible.

3.4. Other status categories

3.4.1. Data deficient

Not applicable.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Blue Ash (*Fraxinus quadrangulata*) is classified as Threatened in Ontario based on meeting criterion C2a(i) with fewer than 10,000 total individuals and no sites with more than 1000 mature individuals. It was previously designated as Special Concern by COSEWIC and COSSARO in 2000 but has been uplisted to Threatened due to new threats, specifically the invasive Emerald Ash Borer and overbrowsing by an expanding White-tailed Deer population.

5. Information sources

Ambrose, John. pers. comm. 2015. *Email to James Kamstra*. November 28, 2015.

Campbell, J. 2012. Ashes (Oleaceae: *Fraxinus*) in Kentucky, including the three white ashes, with notes on plans for conservation in response to the Emerald Ash Borer.

Proceedings of Emerald Ash Borer Meeting in Wooster Ohio, 12-13 October 2011, 51 pp.

COSEWIC. 2014. [COSEWIC assessment and status report on the Blue Ash *Fraxinus quadrangulata*, in Canada](#). Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv + 39 pp.

Gard, Otis. pers. comm. 2015. University of Guelph. Email to James Kamstra. December 3, 2015.

Larson, B.M., J.L. Riley, E.A. Snell and H.G. Godschalk. 1999. The Woodland Heritage of Southern Ontario: A Study of Ecological Change, Distribution and Significance. Federation of Ontario Naturalists, Don Mills, ON. 262 pp.

NatureServe. 2015. [NatureServe Explorer: An online encyclopedia of life](#) [web application]. Version 7.1. NatureServe, Arlington, Virginia. [website accessed 21 November 2015].

Tanis, S. R., and D. G. McCullough. 2012. Differential persistence of Blue Ash and White Ash following Emerald Ash Borer invasion. *Canadian Journal of Forest Research*

42: 1542-1550.

Voss, E.G. and A.A. Reznicek. 2012. Field Manual of Michigan Flora. University of Michigan, Ann Arbor. 990 pp.

Waldron, G. 2003. Trees of the Carolinian Forest: A guide to species, their ecology and uses. Boston Mills Press, Erin, Ontario, Canada. 275 pp.

Waldron, Gerry. pers. comm. 2015. Email to James Kamstra. November 25, 2015.

Appendix 2: Technical summary for Ontario

Species: Blue Ash (*Fraxinus quadrangulata*)

Demographic information

Demographic attribute	Value
<p>Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.</p>	50 to 100 years
<p>Is there an observed, inferred, or projected continuing decline in number of mature individuals? There is evidence of low levels of mortality due to Emerald Ash Borer, which has been present within the range of the species since 2002. Conversion of forests to agriculture and urban areas also continues and presumably removes some trees.</p>	Yes
<p>Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations. Projections are not possible because it is unclear if uninfested trees are resistant to EAB or have not been attacked yet.</p>	Unknown
<p>Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations. Over the last 150-300 years (3 generations), there have been a severe declines in forest cover in SW Ontario, some of which likely resulted in habitat loss and fragmentation of Blue Ash sites.</p>	Unknown
<p>Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations. Based on surveys, declines from Emerald Ash Borer are occurring. Rate is very low and needs to be monitored. Also there is a growing deer population that may be impacting Blue Ash</p>	Unknown
<p>Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.</p>	Unknown
<p>Are the causes of the decline a. clearly reversible and b. understood and c. ceased?</p>	No
<p>Are there extreme fluctuations in number of mature individuals?</p>	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO).	8,884 km ²
Index of area of occupancy (AOO).	272 km ²
Is the total population severely fragmented?	<p><i>Unknown</i></p> <p>Most sites where Blue Ash occurs are small and separated by considerable distances and are thus highly fragmented. However, dispersal distances of Blue Ash are unknown as are the minimum patch sizes and inter-patch distances to support a viable population. Thus although fragmentation may cause declines in habitat quality its effects on genetics and dispersal and viability of subpopulations are unknown.</p>
Number of locations (as defined by COSEWIC).	<p>5 (>10)</p> <p>Locations are defined by the most significant threats at each site as follows:</p> <ol style="list-style-type: none"> 1. Middle Island: threat of nesting cormorants. (1 location) 2. All sites are potentially affected by deer browsing, except those on Pelee and Middle Islands where there are no deer. The number of locations could vary from 1 to many depending upon the potential for effective management of deer populations, but the case can be made for 3 management units (3 locations) 3. All sites are impacted by Emerald Ash Borer, which could likely act similarly across all sites, but this threat is only considered the most significant threat at Pelee Island (1 location). (Alternatively, 2 locations if Emerald Ash Borer is the most significant threat)
Number of NHIC Element Occurrences	56
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	No

Is there an observed, inferred, or projected continuing decline in number of populations?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	No
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat? The presence of abundant Deer and Emerald Ash Borer may reduce the quality of the habitat of Blue Ash.	Yes
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of mature individuals in each sub-population or total population (if known)

Assuming that most occurrences have been documented, the total number of mature individuals is likely less than 2,500. However, it is possible that additional search effort could result in a total above this threshold.

Qualitative analysis (population viability analysis conducted)

Not done.

Rescue effect

Rescue effect attribute	Likelihood
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes Possible for a small number of populations
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Possibly

Is the species of conservation concern in bordering jurisdictions?	Yes known from nearby Ohio and probably Michigan Yes – S1 in Pennsylvania and Wisconsin; not ranked in Ohio, Michigan, New York
Is rescue from outside populations reliant upon continued intensive recovery efforts?	No?

Appendix 2: Adjoining jurisdiction status rank and decline Information regarding rank and decline for Blue Ash

Jurisdiction	Subnational Rank	Population Trend	Sources
Ontario	S3	n/a	NatureServe 2015
Quebec	Not Present	n/a	n/a
Manitoba	Not Present	n/a	n/a
Michigan	SNR	n/a	NatureServe 2015
Minnesota	SNR	n/a	NatureServe 2015
Nunavut	Not Present	n/a	n/a
New York	Not Present	n/a	n/a
Ohio	SNR	n/a	NatureServe 2015
Pennsylvania	S1	n/a	NatureServe 2015
Wisconsin	S1	n/a	NatureServe 2015

Acronyms:

AOO: area of occupancy

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

COSSARO: Committee on the Status of Species at Risk in Ontario

EOO: extend of occurrence

ESA: Endangered Species Act

GRANK: global conservation status assessments

IAO: index of area of occupancy

MNRF: Ministry of Natural Resources and Forestry

NHIC: Natural Heritage Information Centre

NNR: Unranked

NRANK: National conservation status assessment

SARA: Species at Risk Act

SNR: unranked

SRANK: subnational conservation status assessment

S1: critically imperiled

S3: Vulnerable

CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario