

**Ontario Species at Risk Evaluation Report for
Black Ash**

Frêne noir

**wikp, wiskoq ehsa, wiisagaak/wiisagaatic,
aagimaatig/aagimaak/aasaakamig/aagamaatig**

(Fraxinus nigra)

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

Assessed by COSSARO as Endangered

October 2020

Frêne noir (*Fraxinus nigra*)

Le frêne noir est une essence de feuillu de taille moyenne, intolérant à l'ombre, qui se retrouve dans des endroits humides ou détrempés comme les marécages, les bogues et les zones riveraines. Comme chez les autres espèces de frêne (*Fraxinus*), le pollen et les graines du frêne noir sont transportés par le vent, et l'espèce se régénère facilement à partir de graines et de rejets de souche. L'espèce se retrouve dans presque tout l'Ontario (MRNF, 2020), son aire de répartition allant du sud de l'Ontario à l'est jusqu'à la frontière du Québec, à l'ouest jusqu'à la frontière du Manitoba et au nord, jusqu'à environ 51° de latitude. Bien que le frêne noir soit relativement répandu en Ontario et dans les provinces et États voisins (Manitoba, Québec, Minnesota, Wisconsin, Michigan, Ohio, New York et Pennsylvanie), les raisons supposées de la diminution de sa zone d'occurrence et de son indice de zone d'occupation seraient une forte mortalité survenue dans les zones touchées par l'agrile du frêne.

Les résultats de l'évaluation du frêne noir en Ontario le classent dans la catégorie des espèces en voie de disparition en raison des diminutions prévues du nombre total d'individus, qui s'élèveraient à plus de 70 % au cours des 100 prochaines années (2 générations). À l'heure actuelle, 53 % de l'aire de répartition ontarienne est considérée comme sensible à l'agrile du frêne, et de 78,16 à 99,98 % de cette même aire pourrait être touchée sur les deux prochaines générations en raison des changements climatiques. La mortalité prévue du frêne noir devrait dépasser les 90 % dans la majeure partie de la zone touchée par l'agrile du frêne.

La responsabilité de protection de l'Ontario est jugée imposante, compte tenu du fait que l'espèce est en péril à l'échelle mondiale (UICN, 2017) et qu'au moins 25 % de l'aire de répartition mondiale de l'espèce se trouve en Ontario.

Le statut de cette espèce diffère de celui découlant de l'évaluation du COSEPAC (2018). L'évaluation faite par le COSEPAC montrait que l'espèce répond aux critères d'espèce en voie de disparition, mais qu'elle se rangeait dans la catégorie des espèces menacées en raison de facteurs susceptibles de réduire la mortalité au cours de la période projetée. Le frêne noir, évalué en tant qu'espèce en voie de disparition en Ontario, ne répond pas aux critères permettant sa rétrogradation à un statut d'espèce menacée en tenant compte de la responsabilité de protection imposante de l'Ontario et de la dégradation de la situation de l'espèce dans l'aire de répartition plus vaste pertinente sur le plan biologique.

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Executive summary

Black Ash is a medium-sized, shade-intolerant hardwood tree species that occurs on moist to wet sites such as swamps, bogs, and riparian areas. Like other Ash (*Fraxinus*) species, black ash has wind-dispersed pollen and seeds and regenerates readily from seed and via stump sprouting. The species occurs throughout most of Ontario (MNR 2020), ranging from southern Ontario east to the Quebec border, west to the Manitoba border and north to approximately 51° latitude. While Black Ash is still relatively common throughout Ontario and adjacent jurisdictions (Manitoba, Quebec, Minnesota, Wisconsin, Michigan, Ohio, New York, and Pennsylvania), declines in both extent and index of occupancy are inferred based on significant mortality that has occurred in areas affected by Emerald Ash Borer (EAB).

Black ash is classified as endangered in Ontario based on projected declines in the total number of individuals of > 70% over the next 100 years (2 generations). Currently, 53% of the Ontario range is considered susceptible to EAB, and 78.16 – 99.98% of the Ontario range could be affected over the next two generations due to climate change. Predicted mortality of black ash is expected to exceed 90% across much of the area affected by EAB.

Ontario's conservation responsibility is deemed to be significant based on the fact that the species is globally at risk (CR – IUCN 2017) and $\geq 25\%$ of the global range is found in Ontario.

The status of this species differs from that of the COSEWIC (2018) assessment. The species was assessed by COSEWIC as meeting the criteria for Endangered but was designated as threatened due to factors that may reduce mortality over the projected period. Black Ash meets the criteria for Endangered in Ontario and does not meet the criteria for downlisting to Threatened considering Ontario's significant conservation responsibility and the species' declining status in the broader biologically relevant range.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

Black Ash (*Fraxinus nigra* Marshall) is recognized as a distinct species with no accepted sub-species or varieties (COSEWIC 2018; Govaerts 2020).

1.1.1. Designatable units

Black ash is considered to represent a single designatable unit throughout its Canadian range (COSEWIC 2018).

1.1.2. Native status

Black Ash is native to Ontario (COSEWIC 2018).

1.1.3. Occurrence

Black Ash is known to occur in Ontario (COSEWIC 2018).

1.2. Eligibility results

Black Ash (*Fraxinus nigra*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G5 (NatureServe 2016)
- IUCN: Critically Endangered (2017)
- NRANK Canada: N5
- COSEWIC: Threatened (November 2018)
- SARA: No schedule – No Status
- ESA 2007: No Status
- SRANK: S4 (ranked in 2018)

2.2. Distribution in Ontario

Black ash occurs throughout most of Ontario (MNR 2020), ranging from southern Ontario east to the Quebec border, west to the Manitoba border and north to approximately 51° latitude (Figure 1).



Figure 1. Global range of Black Ash (dark green shading).

2.3. Distribution, broader biologically relevant geographic range and status outside Ontario

Black ash is native to adjacent jurisdictions including Manitoba, Quebec, Minnesota, Wisconsin, Michigan, Ohio, New York, and Pennsylvania (COSEWIC 2018).

Black Ash has wind-pollinated flowers (Wright 1953). The winged samaras of ash species are typically dispersed by wind, but long-distance dispersal by water has also been documented (Thebaud and Debussche 1991; Gucker 2005). Samaras may persist on the tree throughout the late fall and winter, promoting dispersal via wind and also over ice (Sims et al. 1990; Tapper 1992; COSEWIC 2018). Black ash is still relatively common throughout adjacent jurisdictions including Quebec and Minnesota, and New York (COSEWIC 2018). As such, cross-border dispersal of seeds is expected to occur relatively frequently when borders are not defined by large waterbodies such as the Great Lakes. However, the declining condition of Black Ash and expanding EAB populations in adjacent jurisdictions limits the potential for rescue effect over the next two generations.

2.4. Ontario conservation responsibility

Approximately 25% of the global range of Black Ash occurs in Ontario¹. The percentage of the global population that exists in Ontario is currently unknown.

2.5. Direct threats

The most significant threat to Black Ash persistence is from the invasive Emerald Ash Borer (EAB) (*Agrilus planipennis* Fairmaire), which has caused severe mortality of ash species throughout the northeastern United States and southern Canada (COSEWIC 2018). EAB was introduced to the Detroit-Windsor area in the 1990s and has since become established in almost all counties in southern Ontario. Aerial surveys conducted by the Ontario Ministry of Natural Resources and Forestry (MNRF) indicate that 242,283 ha of ash forest experienced moderate to severe mortality as of 2016 (Rowlinson 2017). A moderate decline in the total number of mature individuals is inferred based on significant ash mortality that has occurred in parts of southern Ontario affected by EAB (COSEWIC 2018).

Most of the Ontario black ash range remains unaffected by EAB at this point (COSEWIC 2018). However, analyses suggest that 53% of the Ontario range is currently susceptible to EAB and Black Ash will suffer significant mortality over the next 60 years (Desantis et al. 2013; Blaney et al. 2018; COSEWIC 2018). Black Ash is the most EAB-susceptible ash species and populations could experience extreme mortality (up to 99%) within one decade of infestation (Klooster et al. 2014, 2018; Jerome et al. 2017; COSEWIC 2018). However, there is some uncertainty regarding expected mortality rates for northern EAB-susceptible areas, as an increase in EAB mortality associated with decreasing minimum temperatures may reduce black ash mortality in these regions (Venette and Abrahamson 2010; Crosthwaite et al. 2011; Sobek-Swant et al. 2012). Assuming a 1-4°C increase in winter minimum temperatures, 78.12 - 99.98% of the Ontario range could be susceptible to EAB by the year 2100 (Desantis et al. 2013; Blaney et al. 2018; COSEWIC 2018).

Black ash regenerates readily from seed and via stump sprouting (Sims et al. 1990; Wright and Rauscher 1990; Aubin et al. 2015). However, studies of ash regeneration following EAB infestation have reported that the density of new seedlings declined substantially in the years following overstorey mortality, suggesting depletion of the seed bank (Klooster et al. 2014). Moreover, EAB re-infestation of seedlings and sprouts

¹ The proportion of the global range of Black Ash that occurs in Ontario was estimated by clipping the digital range boundary of black ash, created by USGS (1999), to the provincial boundary using ArcGIS software. The total global area of black ash was calculated as 2,207,792 km², while the Ontario range area was calculated as 547,171 km².

as small as 2 cm in diameter has been observed (Aubin et al. 2015), suggesting that that EAB will kill most ash seedlings and sprouts before reaching reproductive maturity (Aubin et al. 2015; Jerome et al. 2017).

The number of black ash locations cannot be precisely quantified but is estimated in the hundreds or thousands. Areas currently affected by EAB (i.e. occurrences within the Canadian Food Inspection Agency's Regulated Zone for Emerald Ash Borer, plus Quebec City and Edmundston, New Brunswick) are considered to represent a single location. Areas outside of the regulated zone but within the climatic tolerance limits of EAB are considered to represent a second location, as natural and human-assisted dispersal rates suggest that all climatically suitable locations could be colonized within one generation (60 years).

2.6. Specialized life history or habitat use characteristics

Black Ash is found predominantly on moist to wet sites such as swamps, bogs, and riparian areas, but may also occur in poorly drained upland sites (Anderson and Nesom 2006). The species is long-lived and trees typically reach reproductive maturity at 60 years of age (Sims et al. 1990). Black Ash is generally polygamous, with unisexual and bisexual flowers borne on the same tree but is occasionally unisexual (Wright and Rauscher 1990). The pollen and seeds are wind-dispersed, although seed may also be transported by water and can occasionally be transported long distances over ice (Gucker 2005).

There are eight vegetation communities in Ontario that are dominated by Black Ash:

Black Ash Mineral Deciduous Swamp Type (S5)

Black Ash Deciduous Organic Swamp Type (S5)

White Cedar - Black Ash Mixed Organic Swamp Type (S5)

Black Ash-Hardwoods/Herb Rich Forest (S5)

Black Ash - Speckled Alder - Sedge Forest (S4S5)

Black Ash Hardwood and Mixedwood Forest (S4)

Hardwood swamp: Black Ash (Other Hardwood): upland transition (S4S5)

Hardwood swamp: Black Ash (Other Hardwood): riparian (S4S5)

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

Black Ash meets the criteria for Endangered, A3ce+4ace.

Past declines in the total number of mature individuals are inferred to have occurred based on mortality of southern Ontario ash populations (COSEWIC 2018). While the decline cannot currently be quantified, it likely represents a small proportion of the total number of mature individuals (COSEWIC 2018). Past declines in EOO and IAO are also inferred but cannot be estimated based on available data.

Significant declines in the total number of mature individuals are projected to occur over the next three generations (COSEWIC 2018). Currently, 53% of the Ontario range is estimated to be susceptible to EAB, and 78.16 – 99.98% of the Ontario range could be affected over the next two generations due to climate change. Predicted mortality of black ash is expected to exceed 90% across much of the area affected by EAB (Klooster et al. 2014, 2018; Jerome et al. 2017; COSEWIC 2018) but may be lower in northern areas due to the gradient in EAB mortality associated with decreasing winter minimum temperatures (Venette and Abrahamson 2010; Crosthwaite et al. 2011; Sobek-Swant et al. 2012).

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

Does not apply. The extent of occurrence is >20,000 km² and the Area of Occupancy is >2000 km².

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

Does not apply. The number of mature individuals is >10,000.

3.1.4. Criterion D – Very small or restricted total population

Does not apply. The number of mature individuals is >1,000, the AOO >20 km², and the number of locations >5.

3.1.5. Criterion E – Quantitative analysis

Does not apply.

3.2. Application of Special Concern in Ontario

Does not apply.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Ontario's conservation responsibility is deemed to be significant based on the fact that the species is globally at risk (CR – IUCN 2017) and $\geq 25\%$ of the global range is found in Ontario.

3.3.2. Status modification based on rescue effect

Not applicable.

3.3.3. Data deficient

Not applicable.

3.3.4. Extinct or extirpated

Not applicable.

3.3.5. Not at risk

Not applicable.

4. Summary of Ontario status

Black Ash (*Fraxinus nigra*) is classified as Endangered in Ontario based on meeting criterion A3ce+4ace.

The status of this species differs from that of the COSEWIC (2018) assessment. The species was assessed by COSEWIC as meeting the criteria for Endangered but was designated as threatened due to factors that may reduce mortality over the projected period. Black Ash meets the criteria for Endangered in Ontario and does not meet the criteria for downlisting to Threatened considering Ontario's significant conservation responsibility and the species' declining status in the broader biologically relevant range.

This status of this species is consistent with the definition of status under the Endangered Species Act, 2007.

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Appendix 1: Technical summary for Ontario

Species: Black Ash (*Fraxinus nigra*)

Demographic information

Demographic attribute	Value
<p>Generation time. Based on average age of breeding adult: age at first breeding = X years; average life span = Y years.</p>	60 years
<p>Is there an observed, inferred, or projected continuing decline in number of mature individuals?</p>	<p>Yes, inferred based on severe mortality of ash populations in southern Ontario and projected northward expansion of EAB.</p>
<p>Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.</p>	<p>Unknown, but 53-99.98% of the Ontario range could be affected by EAB over the next two generations and mortality is expected to exceed 90% across much of the affected area.</p>
<p>Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.</p>	<p>Unknown. Hundreds of thousands of ash trees have been killed in Ontario, but black ash is expected to comprise a relatively small proportion of these individuals.</p>
<p>Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.</p>	<p>Unknown, but 53-99.98% of the Ontario range could be affected by EAB over the next two generations and mortality is expected to exceed 90% across much of the affected area.</p>
<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>	<p>Unknown. Likely a small portion of the total mature individuals has been affected thus far, but 53-99.98% of the Ontario range could be affected by EAB over the next two generations and mortality is expected to exceed 90%</p>

Demographic attribute	Value
	across much of the affected area.
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. No, decline not clearly reversible unless EAB is eradicated b. Yes, cause of decline understood c. No, decline not ceased
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EOO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	1,042,080 km ² . The extent of occurrence (EOO) was estimated for this report based on data presented in COSEWIC (2018). ¹
Index of area of occupancy (IAO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	260,000 km ² . The AOO was estimated for this report based on data presented in COSEWIC (2018).
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is in habitat patches that are: (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No

¹ The extent of occurrence (EOO) and area of occupancy (AOO) in Ontario are not stated COSEWIC status report (COSEWIC 2018) and so were estimated based on the percentage of the Canadian range that occurs in Ontario. The Canadian range of black ash was calculated as 1,055,270 km², while the Ontario range area was calculated as 547,171 km². Given that the Canadian EOO is estimated at 2,004,000 km², and Ontario represents 52% of the Canadian range, the EOO for Ontario is estimated at 1,042,080 km². Given that the Canadian AOO is estimated at 500,000 km², and Ontario represents 52% of the Canadian range, the EOO for Ontario is estimated at 260,000 km².

Extent and occupancy attributes	Value
<p>Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i></p>	<p>Unknown, but potentially 100s or 1000s assuming only 53% of Ontario population is currently climatically susceptible to EAB. Minimum two locations (affected by EAB, and not yet affected) if climate warming eliminates climatic protection from EAB.</p>
<p>Number of NHIC Element Occurrences <i>Request data from MNRF.</i></p>	<p>345</p>
<p>Is there an observed, inferred, or projected continuing decline in extent of occurrence?</p>	<p>Yes, inferred and projected declines associated with loss of small ash populations in southern Ontario.</p>
<p>Is there an observed, inferred, or projected continuing decline in index of area of occupancy?</p>	<p>Yes, inferred declines with loss of ash populations in southern Ontario. Further declines in IAO are expected as EAB range expansion may result in significant mortality throughout much of Ontario.</p>
<p>Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?</p>	<p>Yes, inferred and projected declines with loss of ash populations in southern Ontario. Expansion of EAB northward will likely reduce the number of EOs but may not reduce the number of subpopulations.</p>
<p>Is there an observed, inferred, or projected continuing decline in number of locations?</p>	<p>No. Number of locations is determined by threat of Emerald Ash Borer, or by other less significant threats.</p>
<p>Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?</p>	<p>Yes. Minor declines in area and quality of habitat, primarily around settled regions, with ongoing land conversion for development.</p>

Extent and occupancy attributes	Value
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)

Sub-population (or total population)	Number of mature individuals
<i>Insert additional rows as necessary. If total population, do not use table format.</i>	The Ontario population is estimated at 82,809,273 individuals.

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threat completed in the COSEWIC status report for black ash (2018) lists the following threats:

Invasive and other problematic species and genes: medium
Biological resource use: low

Rescue effect and broader biologically relevant geographic range

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes
Status of outside population(s) most likely to provide immigrants to Ontario	The species is still common in northern Minnesota and Quebec, but the condition in all adjacent jurisdictions is declining.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Yes
Would immigrants be adapted to survive in Ontario?	Probably. Immigrants would likely be adapted to survive within southern Canada but may be maladapted to northern regions.

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Yes. Emerald Ash Borer is rapidly spreading and causing increasing mortality.
Is the species of conservation concern in bordering jurisdictions?	Yes
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	No. Immigration will not significantly affect impacts from Emerald Ash Borer.

Sensitive species

Black Ash is not considered a data sensitive species in Ontario.

Appendix 2: Broader biologically relevant geographic range

Information regarding rank and decline for Black Ash (*Fraxinus nigra*)

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Status & Trends	Condition	Notes & Sources
Quebec	Yes	S3	Declining	(COSEWIC 2018; NatureServe 2020)
Manitoba	Yes	S2	Declining	(COSEWIC 2018; NatureServe 2020)
Michigan	Yes	No status rank	Declining	(Klooster et al. 2014, 2018; NatureServe 2020)
Minnesota	Yes	No status rank	Declining	(Palik et al. 2011, 2012; Minnesota DNR 2020; NatureServe 2020)
Nunavut	No	Not Present	No applicable	(NatureServe 2020)
New York	Yes	S5	Declining	(NatureServe 2020; USDA 2020)
Ohio	Yes	No status rank	Declining	(Klooster et al. 2014; NatureServe 2020)
Pennsylvania	Yes	S5	Declining	(NatureServe 2020; USDA 2020)
Wisconsin	Yes	No status rank	Declining	(NatureServe 2020; USDA 2020)

Broader Biologically Relevant Geographic Range in Other Jurisdictions

Not applicable.

Global Status and Trends

Black Ash is listed as critically endangered by the IUCN under criteria A3e+4ae (Jerome et al. 2017). Black ash is already suffering significant mortality due to EAB across the southern parts of its range and a global population decline of at least 80% is expected over the next 100 years.

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ESA: Endangered Species Act
EO: Element occurrence (as defined by NHIC)
EOO: extent of occurrence
GRANK: global conservation status assessments
IAO: index of area of occupancy
IUCN: International Union for Conservation of Nature and Natural Resources
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
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
IUCN: International Union for Conservation of Nature and Natural Resources
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario