A Cultural Keystone Species on the Brink of Demise:
Assessing Radial Growth of Black Ash and Occurrence of Basket-Quality Trees Before Impacts Associated with the Emerald Ash Borer Invasion

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Summary

Emerald ash borer (EAB) threatens to functionally extirpate black ash (*Fraxinus nigra*), which is an important cultural keystone species for many indigenous American Indian and First Nation tribes with black ash basketry traditions in the northeastern United States and southeastern Canada. Understanding the factors affecting growth of black ash and the occurrence of basket-quality black ash trees is critical for informing future management of the species.

We measured ring widths of 650 increment cores collected from 325 randomly selected trees at 13 sites not yet impacted by EAB located across the St. Lawrence River watershed in northern New York. Sample trees averaged 26.8 ± 5.8 cm in diameter and were assessed for basket quality using qualitative measures commonly used by tribal partners, including bark type, the presence of branches, wounds or bends on the stem, and the presence of conifers.

Basket-quality assessments were additionally evaluated by a local, indigenous black ash harvester and basketmaker. Chronologies of black ash radial growth, ranging in length from 80 to 148 years, were examined.

Dendroecology of black ash in relation to the presence of basket-quality trees provides key information for conservation efforts, which is necessary for the preservation of black ash basketry and ceremonial traditions associated with this cultural keystone species.

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Background & Study Area

Background

Black ash has been utilized throughout its range by many indigenous American Indian and First Nation tribes, including the Saint Regis Mohawk Tribe of Akwesasne in northern New York, for their centuries-old basketry traditions and cultural practices.

Emerald ash borer (EAB), an invasive beetle from Asia that readily attacks and kills black ash, was detected in Akwesasne in 2016 and is currently spreading throughout the greater St. Lawrence River watershed.

We initiated a project in 2021 to assess black ash growth and the occurrence of basket-quality trees in northern New York to inform conservation efforts and management of black ash.

Figure 1. (A) An example of a basket made from black ash; (B) a dead black ash with emerald ash borer galleries visible under the bark; and (C) a map illustrating the range of black ash (hatched area) and the counties with known emerald ash borer infestations (in yellow) in North America.

Black Ash Study Sites

- We selected 13 black ash sites across St. Lawrence and Franklin counties in northern New York to conduct forest condition assessments, examine black ash radial growth, and assess basket-quality trees.
- We used NYS-DEC forest inventory data and local indigenous knowledge to locate potential sites.
- Black ash growth at our sites were not yet affected by EAB infestation; 2 sites had current-year detections.

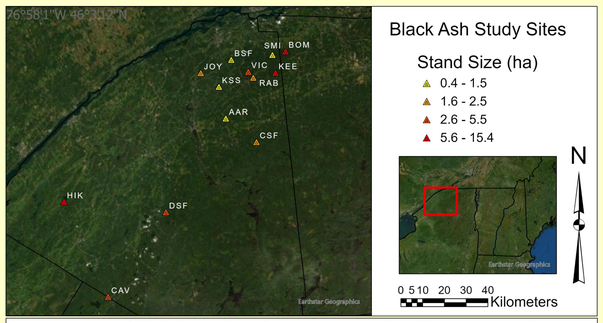

Figure 2. Location of black ash sites (n = 13) in St. Lawrence and Franklin counties in northern New York, USA. Sites were characterized as black ash-dominant habitats in depressional forested wetlands and ranged in size from approximately 0.4 to >15 hectares. Black ash stands in the study area are traditional and contemporary black ash harvest areas for the Saint Regis Mohawk Tribe.

Dendrochronology

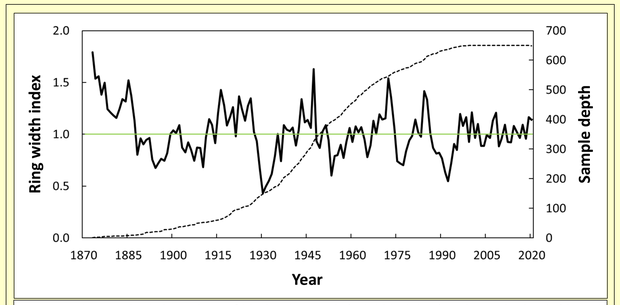

Figure 3. The standard chronology of black ash growth (solid black line) and sample depth (dotted line) from increment cores (n = 650 total cores) sampled to examine the dendroecology of black ash in northern New York, USA. Radial growth of black ash at these sites were not yet impacted by emerald ash borer infestation and reflect variation in growth due to abiotic factors.

Radial Growth of Black Ash

- Two increment cores were collected from 25 live black ash at each site (n = 50 cores per site; n = 650 total cores). Ring widths were measured to the nearest 0.01 mm, crossdated, and verified using COFECHA software.
- The overall chronology of black ash growth across northern New York was 148 years in length, spanning 1873-2020.
- Individual site chronology lengths ranged from 80 to 148 years, with >60% of sites >100 years in length.
- Crossdating statistics within sites were strong; series intercorrelations averaged 0.573 ± 0.017, while mean sensitivity averaged 0.290 ± 0.006.
- More than 75% of the chronology's ring widths had sample depths of >50 cores (i.e., 1909-2020).

Table 1. Number of dated black ash increment cores, total and average length of series (yr), time span of chronology, series intercorrelation, and average mean sensitivity of crossdating of 25 black ash trees at the 13 study sites and overall (n = 25 trees per site; n = 325 total black ash sampled).

Site ID	No. Dated Increment Cores	Total Series Length (yr)	Chronology Time Span	Average Series Length (yr)	Series Intercorrelation	Average Mean Sensitivity
AAR	50	144	1877-2020	60.8	0.525	0.300
BOM	50	116	1905-2020	84.9	0.580	0.314
BSF	50	93	1928-2020	57.2	0.516	0.269
CAV	50	120	1901-2020	75.4	0.676	0.298
CSF	50	124	1897-2020	63.8	0.578	0.321
DSF	50	147	1874-2020	93.0	0.580	0.286
HIK	50	148	1873-2020	78.6	0.521	0.274
JOY	50	88	1933-2020	64.4	0.661	0.321
KEE	50	138	1883-2020	111.2	0.499	0.274
KSS	50	98	1923-2020	62.6	0.645	0.289
RAB	50	94	1927-2020	81.0	0.599	0.275
SMI	50	80	1941-2020	52.1	0.499	0.244
VIC	50	145	1876-2020	73.0	0.574	0.303
Overall	***650***	***148***	***1873-2020***	***73.7***	***0.455***	***0.290***

Acknowledgements

We gratefully acknowledge Angello Johnson, Akwesasne community member and basketmaker, for basket-quality assessments and sharing the location of several black ash sites. In addition, we thank Aaron Barrigar, USDA Natural Resources Conservation Service, for assistance locating potential black ash stands.

Basket-Quality Trees

Assessment of Basket-Quality Black Ash

- Several factors were used to assess basket quality, including DBH, bark type, presence of low wounds or bends, estimated height to first wound or bend, and the presence of nearby conifers.
- Basket quality assessments were additionally evaluated by a local, indigenous black ash harvester and basketmaker, rating trees on a scale from 1-10.
- While all sites had basket-quality trees, average basket-quality ratings varied considerably by site.

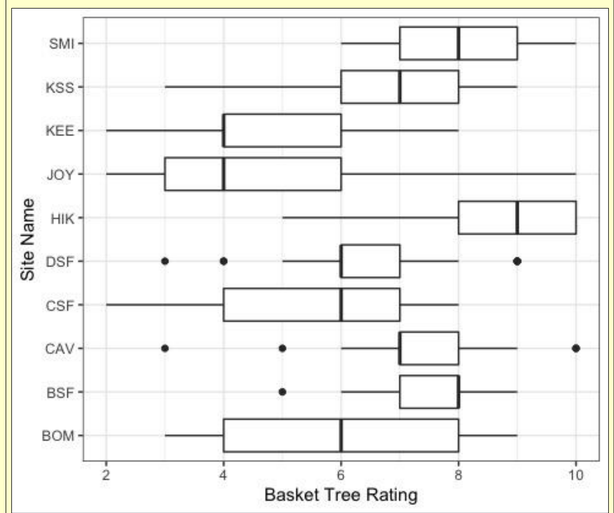

Figure 4. Box plots of basket quality ratings by site exemplify the high degree of variability in basket-quality black ash among and between sites.

Basket-Quality Ratings To-Date

- Trees with higher basket quality ratings averaged greater mean ring width (2.04 ± 0.07 mm) over the course of their full chronology compared to trees with lower basket quality ratings (1.54 ± 0.04 mm).
- Overall, sample trees with corky bark tended to have higher basket quality ratings than smooth-barked black ash, with other bark types being intermediate.
- EAB kills black ash in 2-4 years. All black ash trees, regardless of quality traits, vigor, or site conditions, are at extreme risk of EAB-induced mortality.

Next Steps & Ongoing Related Research

- Continue examining the dendroecology of black ash across our sites in northern New York.
- Identify factors associated with optimal radial growth and the occurrence of basket-quality black ash.
- Develop a habitat suitability model to identify areas with a high likelihood to contain or support basket-quality black ash now and in the future.
- Develop a framework for understanding landscape-level trends of growth to inform preservation efforts and management of black ash in the wake of EAB.