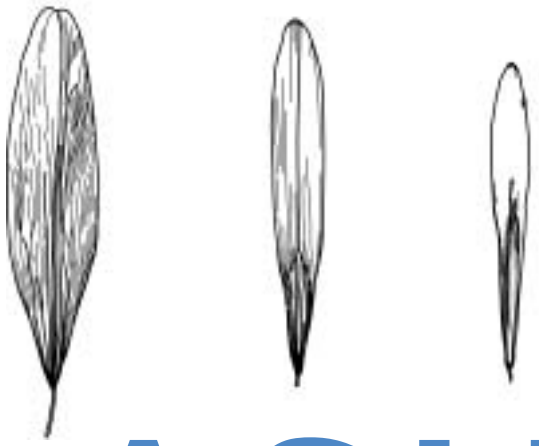

Propagation protocol for

BLACK ASH

Fraxinus nigra Marsh.

Les Benedict and Richard David |

Figure 1. Left to right: Seeds of black ash *(Fraxinus nigra)*, white ash *(F. americana)*, and green ash *(F. pennsylvanica)*.

Line drawing by Amy Rediker

KEY WORDS

Oleaceae, seed propagation, seed collection, bareroot production

NOMENCLATURE

ITIS (2002)

Black ash (*Fraxinus nigra* Marsh. [Oleaceae]) is native to the northeastern portion of North America, from Nova Scotia and New Brunswick east to Ontario and eastern Manitoba, and south through the Midwest and New England to Minnesota, northern Iowa, Indiana, Ohio, and Pennsylvania. Black ash is a shallow-rooted tree commonly found growing in moist to wet muck or shallow organic soils. Habitats include small hummocks within swamps, along small streams in gullies, and in small, poorly drained depressions. It also grows on fine sands and loams underlain by clays and on other poorly drained sites with high water tables. In mesic hardwood upland sites, black ash is restricted to sites with impeded drainage, where it grows on wetter than normal mineral soils. Soil pH ranges from 4.1 to 8.2, depending on site conditions.

Most black ash trees are polygamous, having male, female, and hermaphroditic flowers on the same plant or on separate plants. Small inconspicuous flowers emerge during spring with, or just before, leaf emergence. The fruit is an elongated, winged, single-seeded samara that is borne in terminal or axillary clusters.

HISTORY AND USES

Black ash (Mohawk name: *Ehsa*) has many notable qualities but is especially important for basket making. The wood is used for basket splints, which are obtained by pounding a log with a mallet or axe until it separates along the annual growth rings. Outer sapwood has an attractive satiny, creamy white color and is frequently used for delicate fancy baskets. Inner heartwood has a golden brown color and is slightly brittle. This wood is commonly used for handles, rims, and splints for more robust baskets. The light and unusually strong splints obtained from black ash make the tree of great cultural and economic importance to the Mohawk and other Northeastern native peoples.

The quantity and health of black ash has generally declined in the Northeast and Great Lakes region. Today, the species makes up less than 1% of forest cover in the Northeast. Decline is due to loss of habitat and long-term effects of pollution. Declining trees are also subjected to many pests, such as carpenterworm (*Prionoxystus robiniae* Peck [Lepidoptera: Cossidae]) and fall webworm (*Hyphantria cunea* Drury [Lepidoptera: Arctiidae]), among

others. Diseases include leaf spots, cankers, powdery mildew, and rusts.

In the past, Mohawk (Akwesasne) basket makers obtained their black ash material locally, however, recently they have traveled as far as Maniwaki, Quebec, to find live, suitable trees. The Mohawk Council of Akwesasne's Department of Environment, with its Model Forest Program, has been working on black ash restoration for several years. In 1999, 1000 black ash trees were planted throughout the community.

SEED COLLECTION AND PROPAGATION

Seed collection requires scouting for female and polygamous trees in May and June during flowering. Seeds mature from July to October, depending on elevation, latitude, and aspect. Good seed crops are seen on average of every 5 to 7 y, and they disperse from July to October in the Northeast.

The most important factor for seed collection is recognizing black ash seeds, because green ash (*F. pennsylvanica* Marsh) and white ash (*F. americana* L.) are sometimes found growing in the same vicinity (Figure 1). This is especially important in late fall after leaves have fallen. Black ash seeds are elongated and blunt on the terminal tip and gradually pointed on the end. White ash and green ash samaras are narrower through their length and have a pronounced pointed tip on the end.

We use 3 collection methods. The first method is the use of pruning poles and ladders. Fruit-bearing twigs are pruned closely so that fruit clusters do not disperse during cutting. Seed maturity should be assessed before using this method. Collect fully elongated seeds when they are yellow to brown in color and the endosperm is firm and white.

The second method is to use canvas tarps spread around the base of a seed-bearing tree. If the tree is small enough it can be shaken vigorously to collect seeds. And third, tie a canvas tarp at its 4 corners beneath a good seed-bearing tree. The canvas should be high enough that small animals do not become trapped or persons do not walk into them, and have a drain hole to allow rainwater to pass through easily. This method requires that you check the seed trap daily and separate out other seeds that are caught on the tarp.

After collection, seeds are dried in shallow trays and further cleaning can be accomplished by breaking dried clusters apart by hand, by flailing in paper sacks, or by using a macerator if the seeds are completely dry. Stems can then be removed by fanning or by air screen cleaners with openings of 1 x 1 cm (0.38 x 0.38 in) or slightly larger. We have seen no advantage to de-winging seeds. Desired seed moisture content after drying and processing is 7% to 10% and averages 17 820 seed/kg (8100 seeds/lb). Seeds of *Fraxinus* species can be stored up to 8 y in sealed containers at 5 °C (41 °F) (WPSM 2002).

In nature, black ash seeds go through a natural stratification and after-ripening process as a result of being exposed to warm and cold temperatures over the progression of the season. Seeds exhibit deep simple morpho-physiological dormancy and take up to 2 y to germinate. High summer temperatures followed by warm but slightly cooler autumn temperatures are required to break 1 type of physiological dormancy, and winter temperatures are required to break the second physiological dormancy. Morphological dormancy cannot be broken until high temperatures overcome the first physiological dormancy and seeds are subjected to autumn temperatures. Embryo growth occurs during winter months (Baskin and Baskin 1998).

Using seed sources from a site in New York, we use a 90-d warm stratification, followed by a 90-d cold stratification. Seeds are placed in moistened sphagnum peat moss in aerated plastic boxes. Stratification medium is carefully monitored using a soil moisture probe and moistened when needed. Warm-stratified seeds are kept at room temperature ranging from 16 to 22 °C (61 to 72 °F) during the warm stratification period and then placed under refrigeration for 90 d at 5 °C (41 °F).

BAREROOT SEEDLING PRODUCTION

For field production of seedlings, seed beds are prepared by a spring topdressing of $15N:15P_2O_5:15K_2O$ fertilizer at the rate of 169 kg/ha (150 lb/ac). Fields should have a pH of 6 to 6.5 and adequate calcium levels. The seedbed surface is raked smooth prior to sowing.

For highest germination rates, we sow artificially stratified seeds in May or sow freshly collected seeds from mid-October to early November. Seeds are sown 6 cm (1 in) apart and covered with 6 mm to 1.9 cm (0.25 to 0.75 in) of topsoil and mulched with bark chips at a depth of 7.5 cm (3 in). Mulch provides moisture retention, which is needed during germination and initial establishment, and reduces the need for weeding later in the growing season.

The desired plant density on emergence is 30 to 45 plants/m^2 (10 to 15 seedlings/ft^2). Seed germination continues during the second year and those germinants are transplanted to new seedling beds. Seedlings are susceptible to damping off disease (*Fusarium* and *Rhizoctonia* spp.) during emergence, and disease is controlled by the use of fungicides such as Captan, or preferably, by ensuring adequate air movement around seedlings and by careful irrigation practices at this stage.

Additional fertilizer is supplied during the spring of years 2 and 3 and seedlings are irrigated as needed. Roots are pruned by a horizontal blade mounted on a tractor during June or July. The root pruning zone is 22.5 to 25 cm (8 to 9 in) below soil line. Bareroot seedlings (Figure 2) are ready for lifting 2 to 3 y after initial sowing. For harvest, trenches are dug 38 to 45 cm (15 to 18 in) deep, just below the last root-pruning zone and 30 cm (12 in) from the seedling stems. Roots are combed with a

Photo by Les Benedict

Figure 2. 1+0 black ash seedling.

spading fork to remove soil and wrapped in wet burlap to prevent desiccation. Seedlings are 16 to 42 cm (6 to 16 in) in height with an average caliper of 5 mm (0.25 in).

OUTPLANTING

We find that soil maps are useful tools for selecting outplanting sites. Seedlings are planted 3 to 4.5 m (10 to 15 ft) apart for reforestation and basket materials projects. If needed, competing vegetation is thinned or removed as black ash is shade intolerant. Weed control may be necessary during the first year of establishment. Because black ash grows in wetland and in areas adjacent to wetlands, we do not use herbicides for weed control but manage weeds through cultivation or hand pulling.

At Akwesasne, tree shelters from Treesentials® have been used with excellent results. During the first year of growth, black ash seedlings grew to the length of the 1 m (3 ft) tube. For larger plantings, however, fencing the area from browsing wildlife is a more cost effective alternative.

Basket makers and log pounders have observed black ash regenerating from stumps of previously cut trees. Although we have no information on propagating this species from cuttings, we plan to explore experimental techniques from callus cultures and stem cuttings. This is desired especially if the species continues to decline in the Northeast.

SUMMARY

The future is bright for black ash in spite of many obstacles that threatened its survival and health. Many are taking action to learn more about the tree and how to preserve it, including researchers and basket makers who wish to ensure a plentiful source for basket making in the future. As more information is gained, the hope is that it will be shared with those who desire to preserve and restore this species. Our intention is to restore black ash trees within suitable habitats and on experimental sites within the Akwesasne community. We hope to learn more about the trees' biology and to employ other propagation techniques to ensure its survival, which is vital to Mohawk culture and economy.

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