

A Protocol for Rooting Softwood Cuttings of *Fraxinus pennsylvanica*

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North American ash trees are suffering the devastating impact of the invasive emerald ash borer (EAB). The US Forest Service is developing a traditional breeding program based on the selection of surviving ash trees with a healthy crown after peak EAB infestation, termed “lingering ash”. Currently, lingering ash are grafted for use in the program, but because rootstock plants are often susceptible to EAB, propagules on their own roots would be more resilient. The techniques described have produced vigorous *F. pennsylvanica* (green ash) propagules to use for breeding, experimentation, and restoration. In the first trial year, 2019, twelve different treatments were defined from combinations of four factors: environment, media, copper root drench, and hormone application. Five different ash species and hybrids were tested: *F. quadrangulata*, *F. pennsylvanica*, *F. nigra*, *F. pennsylvanica* x *americana*, and *F. mandshurica* x *nigra*, each assigned to at least one of the twelve treatments. Overall species rooting success rates were calculated—10%, 14.9%, 26.7%, 17.3%, and 0%, respectively—and then used to refine the protocol to use the following year on 2- and 3-year-old green ash seedling stump sprouts. Use of the updated techniques increased rooting rate from 14.9% to 83.6%. Total overwinter survival increased from 81% to 95%. Environment, hormone application and timing, and species were all found to significantly affect rooting. Results are now being used to further refine the softwood rooted cuttings protocol, with a focus on its use on older green ash materials and additional species including black, blue, and Manchurian ash.