

## The Chapter Breeding Program of the American Chestnut Foundation

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### Abstract

A unique feature of the American Chestnut Foundation breeding program is the use of volunteers to conduct most of the regional breeding that will help increase genetic diversity and preserve local adaptation in the products of our program. This effort is coordinated by the four authors of this abstract, who are employees of the Foundation. The Foundation has 16 state chapters spread over almost the entire range of the American chestnut (*Castanea dentata* (Marsh.) Borkh.). Fourteen chapters have active breeding programs. The chapter with the most advanced program, Pennsylvania, has been planting a B3-F2 seedling seed orchard for a number of years, and is starting to harvest B3-F3 seed from the selections. The stages of breeding at other chapters range from making B3 crosses, to making selections, to beginning to plant B3-F2 orchards.

The chapters make one backcross onto local American chestnut trees using pollen from B2 and B3 trees at the Foundation's professionally operated Meadowview facilities. Most chapters have been using the 'Graves' and 'Clapper' sources of blight resistance, since these exist in about 30 unique American backgrounds each. The chapters endeavor to cross pollen from 20 backgrounds onto 20 local chestnut trees; 20 backgrounds yields a reasonable prospect of avoiding population collapse from inbreeding depression, with an inbreeding effective population size of about 72. Collectively across all units, the inbreeding  $N_e$  (effective breeding number) for 'Graves' and 'Clapper' combined exceeds 500.

Full recovery of local adaptation may not occur with only one cross onto local trees, but may enable that adaptation to be recovered by natural selection. As the number of regional science coordinators has increased, and the collective knowledge of the chapters has increased, the ability of chapters to embark on more complex breeding endeavors has increased. Increasing additional sources of resistance into 20 American backgrounds with two cycles of backcrossing should be possible.

The regional science coordinators also are developing a curriculum to train volunteers to plant and monitor forest test plantings. This will need to be a focused, long-term, effort should the performance of the trees be sufficient. It should be an interesting process, hopefully increasing awareness of the forest as well as producing valuable data.

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