Progress report – Year 1
March 2019

Title: Reseeding restored forests: Can seed dispersal mutualisms amplify restoration of American chestnut (*Castanea dentata*)?

Principle Investigators

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Study summary

This study will examine the effectiveness of Blue Jays (*Cyanocitta cristata*; Fig. 1) as dispersal vectors of American chestnut (*Castanea dentata*), such that they may facilitate the reintroduction of this charismatic and ecologically important tree species. In this first year of our multi-year efforts, we sought to implement a two-pronged effort at answering this question. First, in order to determine if Jays show preferences for their current main seed resource, oak (*Quercus* spp.) acorns, we established selection trials to determine if they disperse more or less chestnuts, when acorns are available. Second, in order to determine the suitability of jays as dispersers, we tracked chestnut seeds using radio transmitters to jay cache locations and planted viable seeds at these known cache sites and paired random locations and will track germination rates. We are conducting this work at Vinton Furnace Experimental Forest in southeastern Ohio. Both the loss of American chestnut and the declines in Oak-Hickory forest represent historic and contemporary perturbations to plant-animal interactions. Understanding the capacity of Blue Jays, a prolific seed disperser, to facilitate chestnut and oak dispersal, and their seed preferences, is an import piece to sustaining these forests.

Progress to date

Seed selection trials: We established six platforms in the study area for seed selection trials. Each platform was monitored with two motion-activated game cameras (Fig. 2A). We performed two complete selection trials in early December: black oak (*Q. velutina*) acorns vs. chestnuts (BC3F3 hybrids), and white oak (*Q. alba*) acorns vs. chestnuts. Each trial began with 50 seeds of each species on all six platforms (Fig 2B). We then monitored the order in which seeds were removed from platforms and the species taking them (usually Blue Jay, but also Tufted Titmouse *Baeolophus bicolor* and Red-bellied Woodpecker *Melanerpes carolinus*). For black oak vs chestnut trial, we acquired data on 170 selections (73 black oak acorns and 97 chestnuts). For white oak vs chestnut trial, we have data on 397 selections (220 white oak acorns and 177 chestnuts). In a third trial at one highly visited platform, we deployed black oak vs. white oak vs. chestnut trial and collected data on 82 selections (9 black oak, 41 white oak, 32 chestnut). For all of the trials statistical analysis is ongoing to take into account the choice set which will be the key metric to address selection (i.e. how many acorns and chestnuts available at the time of selection).

Blue Jay dispersal: We placed small radio transmitters in acorns and chestnuts and presented them at platforms to track dispersal distance (Fig. 3A). We subsequently tracked 42 nuts (27 chestnuts, 12 black oak, five white oak). Twenty of these nuts were either dropped or eaten, two went missing, six were never taken (four black oak and two chestnuts), and 14 were cached (three black oak, two white oak, nine chestnuts; Fig 3B). Distances of cached nuts from the platforms ranged from 8 meters to 124 meters (two missing nuts may have been further, likely over 200m).

In late January, we planted two chestnuts at each cache site (n=14) and two chestnuts at paired random sites (n=14) the same distance from platform in a random direction. We placed a hardware cloth cage over these plantings to exclude seed predators. We plan to monitor germination and growth throughout spring and summer. At each of these 28 sites, we also planted two chestnuts outside the cages to monitor the seed predation rate. As of late February (one month after planting), 39 of 56 chestnuts (70%) had been predated. In Spring 2019, we plan to measure litter and duff characteristics at cache and random sites, as well as vegetation variables (canopy cover, light penetration, shrub density).

Outreach

With the success of our first years work we are excited to have the opportunity to share this ongoing research at the upcoming The Birds of Vinton Furnace and an event for Ohio Educators as part of the Forestry on Ohio's Public Lands: Teacher Field Days June 4 at Vinton Furnace State Forest. In addition, we are excited to present this research on October 11 as part of the Day in the Woods program on woodlands and wildlife research offered by Vinton Furnace and Ohio State Extension.

Figure 1. A Blue Jay is fit with a radio transmitter.

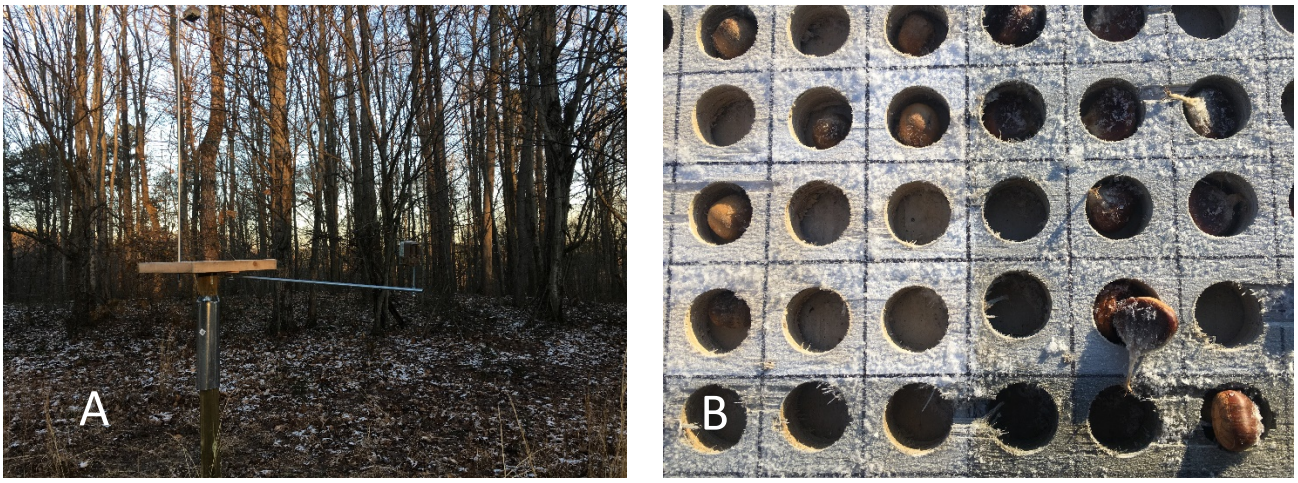

Figure 2. Platforms used for seed selection trials. We fit platforms with motion sensitive cameras to identify visitors (A) and filled each with different combinations of oak and chestnut seeds (B).

Figure 3. Chestnuts with radio transmitters inserted and resealed with wood putty (A) and an uncovered radio transmittered chestnut in a Blue Jay cache location (B).