THE GENETIC AND ENVIRONMENTAL DRIVERS OF RED OAK (*QUERCUS RUBRA*) PHENOLOGY

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Bud phenology (budburst specifically) of temperate eastern North American trees has advanced 5 to 10 days over the past 50 years. This early onset of spring creates a feedback with the climate system, making our ability to predict phenological timing a key component of predicting climate change. This project leveraged a widespread system of phenological cameras (phenocams) in a novel way to quantify the genetic and environmental drivers of leafout variation in the dominant species red oak (*Quercus rubra*) and integrate this into a process-based model. First, we parameterized a phenological model by using branch cuttings and growth chamber experiments to find reaction norms across dormancy, warming, and photoperiod treatment of diverse populations. Next we validated our predictions using a network of phenocams, by genetically sequencing red oak individuals growing in phenocam "viewsheds". Our work thus far has highlighted the key environmental drivers of leafout phenology in *Q. rubra* populations from across the range, uncovered key genes associated with phenological timing, and is pioneering new methodology for taking both genes and environment into account for our predictions.

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