

# CBI Field sampling campaign to GWAS site

## Background

- The goal of the study is to determine the degree of variation in the dehydration tolerance and its underlying basis in a genome-wide association study (GWAS) of black cottonwood (*Populus trichocarpa*) growing under limited irrigation at extremely hot and dry sites in Arizona and eastern Oregon.

## Approach

- A shoot growth assessment and a leaf sample collection campaign were conducted at Bradshaw Ranch near Sedona, AZ in June, 2018, to determine the relative growth rate (RGR) and leaf metabolite profiles by gas chromatography-mass spectrometry (GCMS) that will be conducted over the next year.
- 441 plants including 335 unique genotypes (93 genotypes replicated) were sampled.

## Outcomes

- Although there was only a ~1% mortality (4/445 trees) from last December, 20% of the trees (89 plants) had relative growth rates (RGR)  $< -0.05$  %/d as a result of shoot abscission (dieback) from drought.
- In contrast, 8% of trees had RGR  $> 0.20$  %/d, with the best performing tree growing at  $> 0.45$  %/d.
- A key uncertainty is whether the fastest growing genotypes this year will remain so as their larger leaf areas increase their demand for available water and the degree of drought stress experienced.

## Significance

- The study will identify poplar genotypes that are drought tolerant (i.e., remain productive under drought stress) and the underlying biochemical mechanisms. Coupling metabolomic responses with dehydration tolerance will identify metabolite production genes that can be selected for in breeding populations that will sustain biomass production under limited water availability.

