

# Ten initial BESC *Populus* TOP lines identified with attractive biofuel traits in conversion and growth

## Background

- The BioEnergy Science Center (BESC) has created or identified thousands of *Populus* lines or individual plants with potential enhanced biofuel production traits. We systematically identify those with the best biofuel production and growth traits.
- Populus* is a fast growing woody species and a good bioenergy feedstock.

## Approach

- Populus* lines representing over 600 transgenic gene constructs and over 1000 sequenced natural variant plants are under analysis for reduced cell wall recalcitrance and/or greater wall sugar content (Fig. 1).
- BESC implemented a selection procedure to identify those with the least recalcitrance to conversion and/or greatest cell wall sugar content while maintaining or enhancing growth.
- These lines, designated TOP lines, were then accepted into a pipeline designed to analyze in greater detail their growth, cell wall traits and biofuel potential in comparative greenhouse and field trials (Fig. 2 for transgenics).
- Traits to be analyzed include global transcript levels (RNA-seq), sugar release potential and wall composition (e.g., advanced saccharification and glycome profiling assays) and a microbial bioconversion assay into ethanol (Fig.3).
- This data from TOP line analyses will be assembled into our Laboratory Information Management System to facilitate comparisons.

## Outcome

- Ten *Populus* lines (five natural variant and five transgenic) with modifications in pectin or lignin pathways or in sugar monomer transfer, carbon flux, regulation or unknown activities have been selected for this advanced analysis to date.

## Significance

- Simultaneous comparison of *Populus* TOP lines for enhanced growth and biofuel traits will allow BESC researchers to identify the best among them to further evaluate in field studies (e.g., to determine sustainability traits) in preparation for application and licensing with commercial partners.

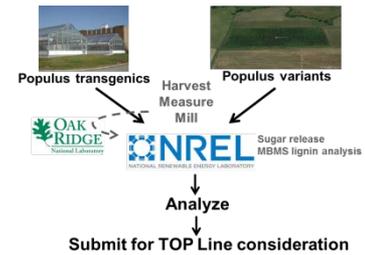


Figure 1: *Populus* analysis pathway for TOP line identification.

TOP *Populus* transgenic lines: greenhouse and field trial

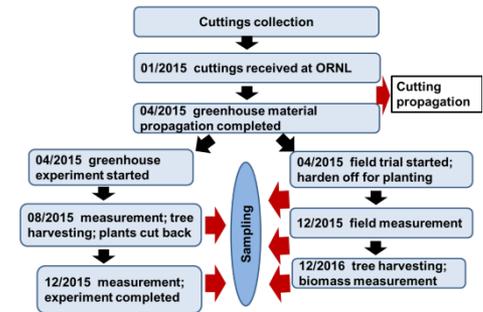


Figure 2: *Populus* transgenic propagation and greenhouse/field timelines. Dates are approximate.

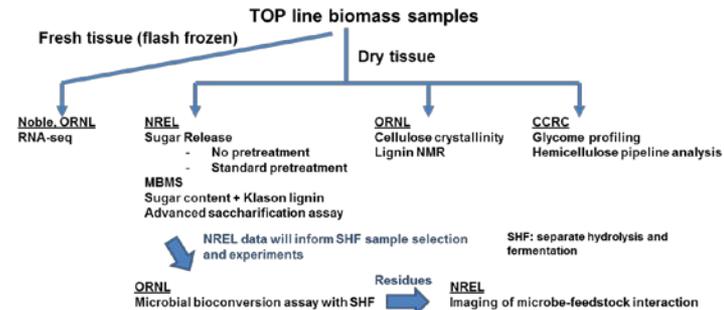


Figure 3: TOP line biochemical and chemical trait analysis pipeline.