Title: The Switchgrass Genome: Polyploidy and Introgressions Facilitate Climate Adaptation and Biomass Yield

Authors: John Lovell[1*] (jlovell@hudsonalpha.org), Alice MacQueen[2], Sujan Mamidi[1], Jason Bonnette[2], Jerry Jenkins[1], Joseph Napier[2], David Lowry[3,4], Jane Grimwood[1], Jeremy Schmutz[1,5], and **Thomas Juenger**[2]

Institutions: [1]Genome Sequencing Center, HudsonAlpha Institute for Biotechnology, Huntsville, AL, USA; [2]Department of Integrative Biology, University of Texas at Austin, Austin, TX, USA; [3]DOE Great Lakes Bioenergy Research Center, Michigan State University, East Lansing, MI, USA; [4]Department of Plant Biology, Michigan State University, East Lansing, MI, USA; [5]Department of Energy Joint Genome Institute, Lawrence Berkeley National Laboratory, Berkeley, CA, USA

Project Goals: We built and analyzed the switchgrass genome to facilitate faster and more effective breeding for bioenergy feedstock production. In particular, we sought to: 1) define the quantitative genetic structure and molecular gene pools that can be targeted by traditional breeding, 2) find targets for genomic or marker-assisted selection through genetic mapping of climate adaptation, and 3) determine the roles that introgressions, polyploidy and other complex processes play in the evolution of switchgrass.

Abstract text: As climate and natural environments change in exceptional ways, it is increasingly critical to understand and make predictions about the fate of natural populations and productivity of agricultural systems. Plant genomes offer one mechanism to achieve this goal by presenting glimpses into the past and future of crop and wild populations. For example, historical climate variation (e.g. glacial-interglacial cycles) is a key analog for current and future environmental change, one that we explore here to dissect the genomic mechanisms of adaptation and yield improvement in the polyploid biofuel crop, switchgrass.

References/Publications

1. Lovell, J.T., MacQueen, A.H., Mamidi, S. *et al.* Genomic mechanisms of climate adaptation in polyploid bioenergy switchgrass. *Nature* (2021). https://doi.org/10.1038/s41586-020-03127-1

Funding statement: This research was supported by the DOE Office of Science, Office of Biological and Environmental Research (BER), grant no. DES-C0014156. The work conducted by the U.S. Department of Energy Joint Genome Institute is supported by the Office of Science of the U.S. Department of Energy under Contract No DE-AC02-05CH11231.