# GENETIC IMPROVEMENT OF HYBRID POPLAR FOR THE RENEWABLE FUELS INDUSTRY: A PACIFIC NORTHWEST PERSPECTIVE

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More than 14,000 hectares of poplar plantations are being managed in the Pacific Northwest by the pulp and paper, timber, and the environmental-services industries. The success of these operations has been due in large measure to the availability of highly selected, elite plant material of superior growth and adaptability, the selection of which has been tailored to three main criteria: 1) compatibility with plantation management practices (e.g., ease of clonal propagation, rapid growth, pest resistance, good stem form); 2) adaptability to local climatic and edaphic conditions; and 3) suitability of wood and fiber properties for paper and lumber manufacture (e.g., wood specific gravity, fiber length, cell wall thickness). Poplar is now being considered as a priority feedstock for the cellulosic liquid fuels industry. Whether it contributes to the Northwest's future renewable energy portfolio will depend upon the availability of cultivars of high biomass productivity coupled with high rates of conversion within specific liquid fuels production processes. Two approaches are being used in breeding new *Populus* energy varieties. First, variation in wood specific gravity, calorific value, and carbohydrate and lignin chemistry is being quantified in advance of a revised hybridization plan for feedstock improvement in the *P.* × *canadensis* and *P.* × *generosa* taxa. Secondly, molecular tools are being developed to identify DNA sequence variation in genes underlying phenotypic variation in cellulose quantity, quality, and extractability in *P. trichocarpa* and *P. nigra* breeding populations. The focus of both approaches is the design of a genomics-assisted hybridization program for a new class of energy cultivars, the biomass of which will be competitive with other cellulosic feedstocks when measured on the basis of the price per unit of delivered carbohydrate and the ease of conversion to liquid fuels.

KEY WORDS: genetic improvement, wood chemistry, *Populus*, renewable energy, genomics

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