Cooperative Linkages for *Populus* Research and Applications in North America: A Comprehensive Database from 1980 to 2010

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Highly productive *Populus* species and hybrids (hereafter referred to as poplars) are an important component of current and future North American energy strategies. These short rotation woody crops can be strategically placed in the landscape to conserve soil and water, recycle nutrients, and sequester carbon. Additionally, poplars are vital to reducing our dependence on nonrenewable and foreign sources of energy used for heat and power. Most poplar research during the past 30 years primarily falls into six general categories: genetics, growth and productivity, insects and diseases, physiology, phytotechnologies, and silviculture. We are constructing a comprehensive, annotated database of peer-reviewed literature, dating back to 1980, and are compiling these papers into one readily-accessible cd-rom. The database will be released at the Fifth International Poplar Symposium (IPS V) to be held in Orvieto, Italy from September 20 to 25, 2010. The database will also be available online, with specific details to follow. All papers are listed within and cross-listed between the six categories, greatly improving the ease of literature searching and use with regards to poplar research. We will make this cd free and available at the meeting, and will have copies for distribution. Discussions for improving the database and extending entries beyond North America are welcomed.

Keywords: genetics, productivity, insects and diseases, physiology, phytotechnologies, poplar, silviculture

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Developing the bioeconomy in southeastern Ontario: Lessons learned from the Domtar Hybrid Poplar Plantations.

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Former plantations consisting of purpose-grown energy crops, such as the hybrid poplar plantations in eastern Ontario, have great value for the development of the bioeconomy. The objectives of this study are to summarize the lessons learned from the eastern Ontario hybrid poplar plantations, and propose the need to re-locate and -measure the plantations to increase knowledge of potential lignocellulosic feedstocks in eastern Ontario. The hybrid poplar plantations in eastern Ontario were one of the first and most successful regional programs with energy crops in Canada. The program was a cooperative effort involving the Ontario Ministry of Natural Resources, Domtar Inc., private landowners and the University of Toronto, which was active between 1976 and 1995. The early emphasis of the program was on technology development and transfer. As the knowledge base grew, the program began its transformation to operational fibre production. This included plantations on leased private and Domtar's own lands. In 1995 Domtar took over management of the plantations; however, during the 1990s the endeavor shrank considerably due to the withdrawal of support by the Ministry. The last activities ended when the Cornwall Domtar mill closed its doors in 2005. Lessons that can be learned from the program include the selection and breeding of the best clones, stock production techniques , site preparation and tending activities and the need for prevention and/or early detection of disease, especially *Septoria*, which affected the plantations. The program also demonstrated what incentives, technical and financial assistance the farmers, which are interested in growing purpose-grown energy crops, require. The hybrid poplars of the eastern Ontario plantation program were last re-measured by the Eastern Ontario Model Forest under the national Forest 2020 2003-04 Data Collection and Analysis (Hybrid Poplar and Silver Maple) program. To improve our knowledge of the potentials of hybrid poplar plantations in eastern Ontario, more recent information is required in relation to the growth and yields of the hybrid poplars and other species that are present in these plantations.

Keywords: *Acer saccharinum*, *Populus*, bioenergy, biomass, Silver Maple

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The use of agroforestry principles to grow biomass for bioenergy in southern Ontario, Canada - A case study using tree-based intercropping as an example.

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During the spring of 2006, three willow varieties from SUNY-ESF (SV1, SX67 and 9882-41) were established on marginal land in an agroforestry tree-intercropping arrangement where plots of short rotation willow were planted between rows (spaced 15 m apart) of 20-year-old mixed tree species. As a control, the same varieties were established on an adjacent piece of land without established tree rows.

The study investigated the distribution of carbon and nitrogen pools, fine root biomass and clone yields in both tree-based intercropping (agroforestry) and in a conventional monocropping systems. Willow biomass yield was significantly higher in the agroforestry field, with 4.86 and 3.02 odt ha^{-1} y^{-1} for the agroforestry and control fields, respectively. SV1 and SX67 had the highest yields and 9882-41 the lowest. Willow fine root biomass was significantly higher in the intercropping system (3000 kg ha^{-1}) than in the conventional system (2500 kg ha^{-1}), in the top 20 cm of soil. Differences in fine root biomass between clones followed the same order that was observed for differences in biomass yield: SV1>SX67>>9882-41. Leaf input was higher in the intercropping system (1900 kg ha^{-1}) than in the monocrop system (1550 kg ha^{-1}). Clonal differences in leaf inputs followed the same trends as those for root biomass and yield: SV1>SX67>>9882-41.

Soil organic carbon was significantly higher in the agroforestry field (1.94%) than in the control field (1.82%). A significant difference was found between the three clones; 9882-41 had the lowest soil organic carbon with 1.80%.

In June 2009, no difference was found in soil available nitrogen between the two fields, but in September, soil available nitrogen was significantly higher in the control field.

In December 2009, both fields were harvested (1st cycle) with Anderson bio-baler harvester. Harvest process and bale yield data, harvest moisture content, field drying and loss of moisture etc. will also be discussed.

Keywords: Willow, woody biomass, bioenergy, short rotation woody crops

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