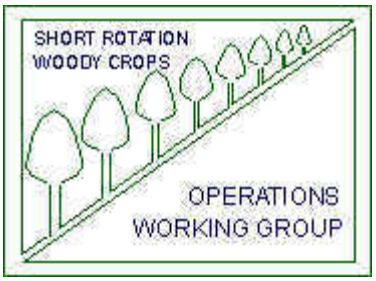

Third Biennial Conference:
Short Rotation Woody Crops Operations Group

October 10-13, 2000
Syracuse, NY

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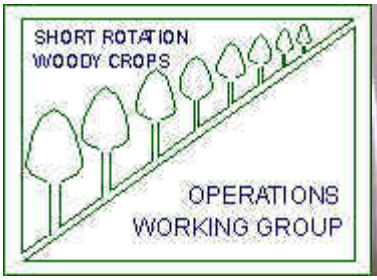

Third Biennial Conference

Short-Rotation Woody Crop Operations Working Group

Poster and Presentation Abstracts

Abstracts are in alphabetical order by the primary author's last name.

Planting and Harvesting Willows: A New York State Experience
Daniel J. Aneshansley, Associate Professor and *Roger A. Pellerin*, Research Associate, Department of Agricultural and Biological Engineering, Cornell University, Ithaca, NY 148453 [Email: dja4@cornell.edu]

The Salix Project has planted more than 300 acres of willows in New York State using two types of planters. The Frobbesta planter plants a double row of 10-inch cuttings. The Step Planter plants two double rows of 7.5-inch cuttings that are cut from 4 to 6 foot whips at time of planting. Although, the Step Planter is much more efficient and economical there are conditions in which Frobbesta planter works well, particularly in small plots. A GPS with data acquisition has been used to collect planting data on the planters.

The Bender Harvester has been selected because of its portability and lower capital cost. The Bender will go into field trials in NYS in 2000 & 2001. A data acquisition system is being developed to record position, weight of harvested product and fuel usage.

The Effect of Clonal Mixing and Planting Density on Herbivory by the Blue Willow Beetle *Phratora Vulgatissima* (Coleoptera: Chrysomelidae)
Alan C Bell, Department of Agriculture and Rural Development, Northern Ireland/ Department of Applied Plant Science, The Queen's University of Belfast, Newforge Lane, Belfast BT9 5PX, Northern Ireland, UK [Email: alan.bell@dardni.gov.uk]; *Sam Clawson,* Department of Agriculture and Rural Development, Northern Ireland; *Alistair R McCracken*, Department of Agriculture and Rural Development, Northern Ireland/ Department of Applied Plant Science, The Queen's University of Belfast, Newforge Lane, Belfast BT9 5PX, Northern Ireland, UK

Willow and poplar are the most promising short rotation coppice species grown presently in the United Kingdom as possible sources of bioenergy. Few invertebrate pests have a serious impact on the yield of these species. However, the chrysomelid beetle, *Phratora vulgatissima*, is the predominant invertebrate pest of willow in the UK causing significant damage and yield loss to willow clones presently being investigated for biomass production. In trials to investigate the effect of monoclone, mixed clone and planting density on the rust, *Melampsora* spp., no significant effect was observed on herbivory by the blue willow beetle. While damage was significant within some clones, planting density and mixed clone plots showed little effect on selective herbivory by the beetles.

The Short Rotation Woody Crops Cooperative Research Program
Mark D. Coleman, USDA Forest Service, PO Box 700, New Ellenton, SC 29809 [Email: mcoleman@ifx.net]

The Short Rotation Woody Crops Cooperative Research Program is a Forest Service led research effort on intensive forest management with participation by DOE, forest industry and university collaborators. Research includes experimental plantings, evaluating growth processes and environmental impacts, studying carbon and nutrient cycling, diagnosing hardwood nutrient requirements, and supporting Savannah River Site phytoremediation efforts. The initial experiment, discussed separately, includes 16 fertigation treatments applied to four species in 95 half-acre plots. A second experiment, under planning, includes evaluating the environmental impacts by monitoring fate and transport of applied chemicals, animal diversity, and stream buffer processes within existing forest for at least one year and continuing during clearing and as established pine and hardwood plantations mature. Hardwood nutrient requirements are evaluated with balanced-nutrition diagnostic and prescription techniques. Prescribed amendments to balance nutrition

and improve growth are tested with field trials. Phytoremediation efforts include supporting DOE Savannah River in their commitment toward solving contamination problems using fast-growing plantations. This regional program supports a national collaborative Forest Service research program to address economically efficient and environmentally sound intensive culture systems.

Short Rotation Woody Crops Cooperative Research Program Experiment A: Fundamental Controls of Growth and Productivity

David R. Coyle and *Mark D. Coleman,* U. S. Forest Service, Savannah River, P.O. Box 700, Building 760-16G, New Ellenton, SC 29809 [Email: dcoyle@fs.fed.us or mcoleman@ifx.net]

The SRWCCRP initial experiment is designed to study growth and nutrient budgets in short rotation woody crop systems. The study area located at the Savannah River Site near New Ellenton, SC was logged in April 1999; site preparation began in May 1999. The site was tilled and slash incorporated to a depth of 30 cm. Loblolly pine, sweetgum, and sycamore seedlings and cottonwood cuttings were planted. A fertigation system was installed, and trees received experimental treatments starting April 2000. ANOVA treatments compared irrigated (I), fertilized (F; 120 kg N ha^{-1}), and I + F with controls (non-I + non-F). Regression plots received a range of fertilizer regimes. Above and below ground tree growth as well as environmental characteristics will be monitored throughout the rotation. Monthly height, diameter, and leaf area measurements on subplots indicate strong treatment differences, as the I + F plots were larger and held more leaf area. Furthermore, trees in F plots were more vigorous than those in I plots, indicating that nutrition seems to be more influential than soil moisture in controlling plant growth.

The Development of a Small Scale Combined Heat and Power Plant Using Down Draft Gasification

W Malcolm Dawson, Applied Plant Science Division, Development of Agriculture and Rural Development Northern Ireland, NIHPBS, Loughgall, Co Armagh BT61 8JB, N. Ireland UK [Email: malcolm.dawson@dardni.gov.uk] and *John Gilliland,* Rural Generation Ltd, Brook Hall Estate, Londonderry, N. Ireland, UK

Since starting research and development work in N. Ireland on SRC Willow as an energy crop, the investigation of markets and utilisation formed an integral part of the project. Downdraft Gasification Technology was sourced from the University of Louvain la, Neuve in Belgium and 100 kW commercial prototype was installed at the Agricultural College in Enniskillen, Co Fermanagh. Developments in design and operation of the gasification system and its associated gas cleaning systems resulted in consistent production of a high quality, clean gas supply allowing continuous engine running and electricity generation. A new company, Rural Generation, was formed, charged with the full commercialisation of the plant. The first of these plants was installed at Brook Hall Estate in Londonderry where 50 ha of willow coppice had been established as the fuel source. A second has been commissioned at Boughton in Nottinghamshire, England where it has been installed at a conference centre. Operational data continues to be collected. Future developments will concentrate on the replacement of the conventional gas/diesel engine with small-scale gas turbine. This turbine has been specially designed by Queens University Belfast to operate on gases with a low calorific value.

Birds Breeding in Short-rotation Woody Crops in New York: 1998-2000

André A. Dhondt and *Keila V. Sydenstricker.* Laboratory of Ornithology, Cornell University

By making regular visits throughout the breeding season we censused the birds breeding in willow and poplar plantations in Central and Western New York. We will report on the density and diversity of birds in plantations of different ages, and discuss to what extent the structure of the clones planted influences the birds' choice for building nests.

Poplar Silviculture: Converting from Pulp Logs to Saw Logs

James A. Eaton, Plant Materials Manager, Potlatch Corporation Hybrid Poplar Program, P. O. Box 38, Boardman, OR 97818 [Email: Jake.Eaton@Potlatchcorp.com]

Responding to increased environmental regulation and declining public timber supply, Potlatch began farming short rotation hybrid poplar in 1993. Over the last seven years, 7000 hectares (17,200 acres) of plantations were established, focusing on the production of pulp logs. In 1998 Potlatch began to examine the use of poplar in higher value solid wood

products. We have identified opportunities to market poplar for use in plywood, furniture stock, molding, and other non-structural applications. Realization of these opportunities presented silvicultural challenges that have not been applied extensively to poplar in North America.

Potlatch is converting the farm to saw log production, emphasizing thinning in the dense plantations, branch pruning to maximize clear lumber recovery, and longer rotations to increase tree size. Future development will be planted at wider spacing (3.7 by 3.7 meters) and managed for longer rotations (10-11 years).

Early results from tree performance in response to thinning and pruning will be presented, along with management practices for saw log production. In addition, conversion activity, mill trials, and product development will be highlighted.

Plantation and Management of Short Rotation Woddy Species for Biomass Production for Wood Energy in Bangladesh

M. Faizuddin, Divisional Officer, Mangrove Silviculture Division, Bangladesh Forest Research Institute, Muzgunni, Khulna-9000 [Phone & Fax: 880-41-762927 Email: elias@Khulnanet.net]

About 95 percent of families in the rural areas of Bangladesh use biomass fuel such as wood, straw, cowdung, husk of grains, jute stalk, sugarcane bagasse and leaves for cooking purposes. About 60-70 percent energy is met by biomass fuel for cooking purposes in the country. To meet up the growing demand of wood energy by the people, the Forest Department planted some short rotation (6 years) and fast growing woody species such as ***Arcadia auriculiformis, A. mangium, Eucalyptus camaldulensis*** and ***Cassia siamea*** at a spacing of 2m x 2m in the degraded sites of Chittagong, Cox's Bazar, Sylhet forest areas and in some districts of northern regions of the country.

The silvicultural practices for the management of the areas covered with short rotation woody species as well as growth and yield, calorific value, impact on the environment, social acceptability etc. of each species have been discussed in this paper. The suitable woody species for biomass production for different dendro-ecological zones of the country have also been recommended.

Delimbing Hybrid Poplar Prior to Processing with a Flail/Chipper

Bruce R. Hartsough, Biological & Agricultural Engineering, University of California, Davis, CA 95616, USA [Email: brhartsough@ucdavis.edu],*Raffaele Spinelli,*Wood Research Institute, National Council for Research via Barazzuoli 23 I-50136 Florence, ITALY [Email: spinelli@service.area.fi.cnr.it],*Steve J. Pottle*, Boise Cascade Fiber Farm, PO Box 500, Wallula, WA 99363, USA [Email: Steve_Pottle@bc.com]

We compared the performance of a flail/chipper for processing a) whole poplar trees and b) poplar trees that had been roughly delimbed with a pull-through delimber. Production rate was about 10% higher for the delimbed trees. The reduced cost of flail/chipping would not cover the additional cost of delimbing with the machine mix tested, but changes to equipment might improve the situation. In the test configuration, the delimber processed 175 trees per productive hour, about half as many as the DDC. Delimbing separated about 35 dry pounds per tree of limbs, which may have higher value than the mixture of limb and bark residues produced by the flail from whole trees.

Phytoremediation of TCE in a Shallow Alluvial Aquifer -- A Field Demonstration --

Gregory J. Harvey, U.S. Air Force, Wright Patterson AFB, OH 45433 [Email: gregory.harvey@wpafb.af.mil]

The efficacy of *Populus deltoides* planted as a short rotation woody crop to phytoremediate shallow ground water contaminated with trichloroethylene (TCE) has been evaluated at the field scale in a multiagency demonstration project in Fort Worth, Texas. This project was led by the Air Force and was conducted as part of the DOD's Environmental Security Technology Certification Program, as well as the USEPA's SITE Program. Planting and cultivation of eastern cottonwood (poplar) trees above a dissolved TCE plume in a shallow (< 3.6 m) aerobic aquifer took place in spring 1996. Data were collected to determine the ability of the trees to perform as a natural pump and treat system. Transpiration measurements indicate that the largest planted trees transpired approximately 14 liters per day during summer 1997; whereas a nearby 19-year-old cottonwood tree was determined to transpire approximately 275 kg per day (J.M. Vose, U.S. Forest Service, oral commun. 1997). Although the trees were transpiring water from the contaminated aquifer during the second growing season they were not hydraulically controlling the plume. Predictions of drawdown at the water table during peak growing season transpiration for mature plantations range from 12-25 cm at the center of the

drawdown cone. The diameter of the predicted drawdown cone ranges from 140 to 210 m. These drawdown predications are associated with a predicated decrease in the volumetric flux of groundwater across the downgradient end of the planted area that ranges from 20 to 30 percent of the water that moved through the site before the trees were planted.

Practical Experiences with the Flevo Project in the Netherlands

Leen Kuiper, Institute of Forestry and Forest Products, Wageningen, The Netherlands

Successes and failures of a new SRWC program in The Netherlands are presented. Do dedicated energy crops have any chance at all in a densely populated area such as The Netherlands? Apparently so, because this spring the first 50 hectares of SRWC have been established successfully in the province of Flevoland. In a couple of years time there will be 200 ha of coppices planted, which are to provide 10 percent of the total feedstock of a biomass fueled combined heat and power plant in Lelystad. However, to get such a demonstration project started at a practical working level was not an easy matter. It took 7 years of preparation plus a detailed business plan and a lot of lobbying to convince local decision makers and the State Forest Service to set aside land for this particular learning process. Substantial government incentives were needed to finally win over a Dutch utility to invest in the bio-power plant. The participatory process required several round table meetings with all stakeholders before a joint letter of intent was signed. A Bioguide was issued, suggesting appropriate and sustainable cropping systems. This helped a lot to level out the last lumps and barriers raised by environmental groups. The result was that no artificial fertilizers and no herbicides were allowed, not even at the initial site preparation stage. Indigenous planting stock of local provenances had to be included. And several product/market combinations had to be identified to underline the integrated approach and the multi-functionality of the project, without which even the project proposal would have nipped in the bud. Nevertheless, the participants were convinced that if the project would succeed in Holland, man, it would be a piece of cake to start a similar project anywhere in the world! That idea kept us going. The project finally took off in 1999 with an initial 12 ha of poplar and willow plantings, of which, unfortunately, only 50% outlived the first growing season. This steep learning curve did not discourage a further plantings of 45 ha of willow cuttings (including the 5 or 6 ha which had to be replanted) in the following season. Status by mid September 2000 is that the crop is doing very well and we seem to have won the race against the weeds. The challenge now is to keep the momentum and to motivate all parties to continue.

Establishing Willow, Poplar and Other Vegetation on a Brownfield Site in Utica, New York

Samuel J. Jackson, Environmental Consultant, ERM Consulting, DeWitt, New York (former MS Graduate student at SUNY-ESF) and *Christopher A. Nowak,* Associate Professor, State University of New York College of Environmental Science and Forestry, Syracuse, New York

Abandoned and underutilized industrial lands, commonly referred to as brownfields, are common throughout New York State and the United States. Reclamation of these sites and possible remediation of soils contaminated with various pollutants may be accomplished through the establishment and growth of plants. Our study addressed the establishment of three vegetation communities on a brownfield site after one growing season, quantified in terms of percent vegetative cover, above and below ground biomass, and survival. Grasses are the standard community employed for the reclamation and remediation of brownfield sites. A randomized complete block design with four replications was used to compare establishment among three different plant communities: planted grass, planted willow and poplar, and a "volunteer" community, in which plants existing on the site were allowed to naturally revegetate the study area. Experimental units were 6 x 6 m plots. Unrooted cuttings of seven willow clones and one poplar clone were planted randomly at 0.3 x 0.3 m spacing in June 1999. The grass and willow/poplar treatment resulted in significantly higher percent cover, 90 and 62 percent, respectively, compared to the volunteer community at 29 percent. There were no differences in above or below ground biomass between the grass community and the willow/poplar community. Overall survival of willow and poplar clones was 90%; clone NM6 *(Populus nigra x P. maximowiczii)* displayed the highest survival at 97%, and S25 *(Salix eriocephala 16x S.erio* 276) survived at a rate of 81 %. Stem biomass production was 1.16 Mg/ha, which is consistent with first year growth on higher quality agricultural sites. Based on one growing season, the grass and willow/poplar communities appear promising for revegetating and remediating the brownfield site.

Willow Biomass Production in Southern Quebec: Potential, Problems and Future Perspective

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The Institute of plant science at the Montreal Botanical Garden is involved in a research program on the intensive

production of woody species (mostly willows) in short rotation culture since 1989. In 1995, a pilot study undertook to address the issue of the abandonment of agricultural in Southern Quebec and to evaluate whether short crop rotation could constitute a partial, rational use of these marginal lands. The study is conducted on different sites in the Upper Saint-Lawrence region located 90 km Southwest of Montreal. It implied a followed up of willow plantations set up according to a special plantation design developed by our research team. The aims were to investigate plant response (growth and productivity) according to various plantation site conditions, fertilization treatments (sludge application), and rotation cycles; to draw up an inventory of fungal pathogens and insects identified on the stems and leaves; and to determine the cost of field operations. The highest biomass yield were always obtained by *Salix viminalis* cultivated on poorly drained site. More than 45 tons of dry material were harvested at the end of the first cycle (3 years of growth), which represents about 15 tons of dry biomass on an annual basis. Harvesting operations done during the second rotation cycle have shown that this annual yield is maintained over the years. Some 35 fungal taxa were identified on stems and leaves of *S. viminalis*. Among them more than 30% have never been mentioned on willows in North America. Evaluation of costs for field operations and potential markets for the biomass will be discussed.

An Economic Application of Agroforestry in Saskatchewan

Rhonda N. Lindenbach-Gibson, M. Sc., B. Comm., Research Associate, The Centre for Studies in Agriculture, Law and the Environment, Colleges of Agriculture and Law, 51 Campus Drive, Saskatoon, Saskatchewan, CANADA S7N 5A8 [Email: rhonda.lindenbachgibson@usask.ca]

In recent years, prairie farms have been plagued with dwindling commodity prices, increasing instability, and escalating transportation costs. In the midst of this farm crisis, many producers are finding that they can no longer make a profitable living by relying solely on the production of traditional crops such as wheat and barley. Recognizing the need to rethink Western Canadian agriculture, many are considering options beyond traditional crops, such as diversification to more value-added products. Agroforestry represents one sector of agricultural diversification that could improve the economic sustainability of prairie agriculture.

The environmental benefits of agroforestry are also receiving increased attention. Foremost among these benefits is the potential to sequester carbon in forested soils and plant matter, which would reduce the concentration of carbon dioxide (CO_2 – the most common greenhouse gas) in the atmosphere. This potential was recognized in the inclusion of some forestry practices in the Kyoto Climate Change Protocol. Since agricultural soils are not included in Canada's emission reduction accounts, attention has been given to forestry and agroforestry as a means of reducing atmospheric stocks of CO_2 through carbon sequestration. This paper will discuss the practice of agroforestry, and assess its economic feasibility in Saskatchewan and carbon sequestering potential in the context of Canada's efforts to reduce its greenhouse gas emissions.

Kraft Pulp from Plantation-Grown Bio-mass Willow

Hannu P. Makkonen, Stephen G. Granzow, and *Emmett S. Cheshire*, Empire State Paper Research Institute at SUNY ESF, Syracuse, NY 13210 [Email: espri@syr.edu Website: http://espri.esf.edu]

A short experimental evaluation was done on the papermaking potential of willow grown on an ESF plantation for biomass energy. The growth rate was 5-7 (max. 13) o.d. gross tons/acre/year (~25-35 m3/ha/a, max. 65 m3/ha/a) rendering it competent in growth with the fast-growing eucalyptus. Three-year old willow pulped fully to kappa number 16.9 and bleached to Brightness 90.2 % with a total yield of 51.4 % from wood. In comparison with a commercial ECF-bleached eucalyptus pulp it was shown that the willow contained good paper properties despite of short fibers (~.54 mm). Willow was proven to be a viable commercial fiber source for fine papers. The favorable growth rate of willow and its homogeneous fiber length distribution along with easy delignification and beating might attract the industry's interest in willow as raw material source for pulping instead of energy due to its papermaking potential.

Problems of Rust (*Melampsora epitea* var. *epitea*) on Short Rotation Coppice (SRC) Willow

Alistair R McCracken, Applied Plant Science Division, Dept. of Agriculture and Rural Development N. Ireland, Newforge Lane, Belfast BT9 5PX, N. Ireland, UK [Email: alistar.mccracken@dardni.gov.uk] and *W Malcolm Dawson,* Applied Plant Science Division, Development of Agriculture and Rural Development Northern Ireland, NIHPBS, Loughgall, Co Armagh BT61 8JB, N. Ireland, UK

Willow has been grown in short rotation coppice in N. Ireland since 1976. In 1986 there was a severe outbreak of rust

caused by *Melampsora epitea* var. *epitea*. Rust is the single most limiting factor in SRC willow production. While early work demonstrated that the disease could be controlled using fungicides, such a strategy was deemed not to be viable. Work over the past fifteen years has been investigating the use of inter- and intra-species *Salix* mixtures as a means of reducing the impact of rust. Currently there is a trial comprising twenty willow varieties planted at three densities, 10 000, 15 000 and 20 000 plants ha^{-1}, in mono-culture and in five, ten, fifteen and twenty way mixtures. Mixtures are effective in reducing the impact of rust on many varieties. Three particularly rust susceptible varieties died out in both mono-culture and in each of the mixtures. Nevertheless, in situations of high disease pressure, mixtures are regarded as the best way of combating rust and of ensuring sustainability over the life of the plantation.

Yield Responses of Growing Inter and Intra Species Mixtures of Willow in Short Rotation Coppices (SRC)

Alistair R McCracken, Applied Plant Science Division, Dept. of Agriculture and Rural Development N. Ireland, Newforge Lane, Belfast BT9 5PX, N. Ireland, UK [Email: alistar.mccracken@dardni.gov.uk] and *W Malcolm Dawson*, Applied Plant Science Division, Development of Agriculture and Rural Development Northern Ireland, NIHPBS, Loughgall, Co Armagh BT61 8JB, N. Ireland UK

Willow can be grown in inter and intra species mixtures as a rust disease control strategy. Mixtures comprising five, ten, fifteen and twenty *Salix* species varieties have been investigated. The dry matter yield from such mixtures was normally higher than the yield from equivalent areas of the constituent varieties grown in mono-culture. There is a trend of increasing yield as the number of varieties increases. Some varieties e.g. *S. viminalis* 77082 and *S. schwerinii x aquatica* V7534 consistently produced significantly higher yields in mixtures. Other varieties e.g. *S. viminalis x caprea* V789, S. *viminalis x aquatica* V7503 and *S. viminalis* 78183 showed no yield benefit for being included in a mixture. There are however other benefits, and in particular the long sustainability of the plantation over twenty to thirty years and the reduced impact of rust on yield over this period.

Percolation Reduction Using Short Rotation Woody Crops: Case Study – Schenectady, NY

David M. McMillan, Donald J. Hughes, Natresco and Associates, Ltd., Hershey, Pennsylvania/ State University of New York College of Environmental Science and Forestry, Syracuse, New York, *Brent E. Weesner* and *Robin A. Wilcox,* General Electric Company, Schenectady, New York.

Water balance models are commonly used for long-term prediction of water movement within a hydrologic system. To assess the ability of native vegetation and short rotation woody crops to minimize percolation at a site in Schenectady, data were collected to quantify and model the water balance within shallow substrate. Components of the water balance were determined using instrumentation installed above and below ground within a stand of pioneer tree species and in an adjacent successional old field community. To measure precipitation, total solar radiation, relative humidity, temperature and wind speed, we installed a micrometeorological station in the old field area. From this we also computed potential evapotranspiration. Changes in soil water storage at both sites were calculated using an array of soil moisture probes installed in the fill. Water flux through the fill was measured using minilysimeters, while sap flow was determined using heat balance sap flow gauges. Surface runoff was estimated. Sap flow was measured on 2 cm diameter branches of a variety of tree species and then extrapolated to the stand level. Sap flow is species dependent and ranges from 2.4 to 2.8 Ga./tree.day. The results of preliminary modeling indicate that percolation is greatly reduced in areas under tree cover when compared with the old field areas. In addition, estimated average daily evapotranspiration from the stand ($380m^2$) ranges from 5.3 to 8.6 mm/day, which exceeds the average daily precipitation during the growing season of 2.7 mm.

The Swedish Case: A Commercial Introduction of SRC in a Large Scale - Experience and Conclusions

Gustav Melin, Agrobränsle AB, Box 1743, SE-701 17 Örebro, Sweden

The production of willow in Sweden is no longer a developing project but the production of a commercial crop among others. The willow wood chips is sold and delivered on the market for solid biofuels. The solid biofuel market consists mainly of forest industry by-products as sawdust, bark and residues from felling. The solid biofuels contribute to 20 % of the total energy consumption in Sweden.

Agrobränsle AB started in 1988, with the mission to commercialize Short Rotation Coppice, SRC. In the year 2000 Agrobränsle sold cuttings to 900 hectares planted. The coming winter we will harvest 3000 hectares and deliver willow

wood chips to 20 different district heating plants in southern Sweden.

When the harvesting machines is now working well, the next challenge is to develop the logistics to be able to transport and deliver the right amount and quality to lowest cost. Prices on solid biofuels have decreased according to taxes on demolition wood in European countries. In the same time costs have increased. Still willow production is competitive in many regions. Especially for land owners without the ordinary machinery for arable production.

The Swedish government has newly decided that Swedish farmers are allowed to establishment grant for 1,000 hectares per year until the year 2003.

Effects of Short-Rotation Forestry Site Preparation Techniques on Soil Mite Communities
Maria A. Minor and *Roy A. Norton,* State University of New York College of Environmental Science and Forestry

Site preparation techniques associated with production of willow (*Salix* spp.), including tillage and herbicide applications, are potentially crucial factors determining soil biological activity and biodiversity. The effects of site preparation methods on the abundance, species diversity and community structure of two taxonomic groups of soil mites (Acari) - Oribatida (saprophages and mycophages) and Gamasina (predators) were investigated in 1998-1999.

20 species of Oribatida and 22 species of Gamasina were found. Total density and species richness of oribatid mites were largely unaffected by site preparation treatments, but tillage had significant effect on the abundance of several individual species. Gamasina showed more pronounced changes in abundance and species diversity in response to site treatments. The success or failure of willow crop and resulting divergence in soil environments created by different plant communities best explains the differences in density and diversity of Gamasina among treatments. The data suggest that 1) tillage and other site preparation techniques have the most important direct effects on soil mites during the first year after planting, but then are superceded by other factors; 2) presence or absence of tillage contributes most to the differences in mite community structure, and 3) soil mite communities are recovering from the stress.

Alternative Scenarios on SRWC as a Fiber Source for Pulp
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NAPAP (North American Pulp And Paper) model have been linked to POLYSYS (USDA agricultural policy analysis model) to study impact of planting SRWC (short rotation woody crops) on agricultural lands. NAPAP is a partial equilibrium model, maximizing consumers and producers surplus sequentially for each period of time. POLYSYS is optimizing net present value of growing various crops over time. When SRWC is considered as one of the crops, then POLYSYS computes optimum allocation of agricultural lands for various crops over time. When NAPAP is ran sequentially after POLYSYS run it computes demand and supply of different type of pulpwood including SRWC. It also computes equilibrium prices for pulpwood over time and passes this information back to POLYSYS for making panting decision. Within a few iterations of NAPAP/POLYSYS runs stable solution is obtained. There are several assumptions put into the models regarding SRWC productivity and costs, which affect the final results. There is also one important factor called "adoption" factor, which limits planting SRWC on potentially available agricultural lands. Given high productivity and costs efficiency of SRWC on agricultural lands adoption factor is largely determines amount of land allocated for SRWC.

Hybrid Poplar Establishment and Production on CRP Land in Minnesota
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The year 2000 marks the seventh year of research being conducted on private landowner Conservation Reserve Program (CRP) plantings of hybrid poplar near Alexandria, MN. These plantations cover approximately 1,800 acres located within fifty miles of the city of Alexandria in West Central Minnesota. The "Minnesota Wood Energy Scale-up Project" is unique in many ways. Data are being collected on larger-scale farmer-owned sites rather than normal small study research plots. These larger sites provide an excellent opportunity to compare seventeen variations of soils, clones, topography,

and management. Landowners receive superior technical and cost assistance for proper maintenance practices because the project is high profile and a priority to all participants.

This project is collecting economic data from planting to harvest that will be useful to the wide and varied farming operations found in West Central Minnesota. These data will also be useful to many U.S. and other state agencies and co-funders. This project, in its seventh year, has already produced useful public information concerning establishment and maintenance, and the associated costs of typical hybrid poplar plantations.

Short Rotation Woody Crops for Florida

James A. Stricker, University of Florida Polk County Cooperative Extension Service, P.O. Box 9005, Drawer HS03, Bartow, FL 33831-9005, [Email: jas@gnv.ifas.ufl.edu],*Gillian R. Alker, Donald L. Rockwood, Douglas R. Carter*, University of Florida, School of Forest Resources and Conservation, P.O. Box 110410, Gainesville, FL 32611-0410 [Email: galker@ufl.edu; dlr@gnv.ifas.ufl.edu; drcart@nervm.nerdc.ufl.edu],*Gordon M. Prine*, University of Florida Agronomy Dept., P.O. Box 110500, Gainesville, FL 32611-0500 [Email: agr@gnv.ifas.ufl.edu] and *Stephen A. Segrest*, The Common Purpose Institute, 724 Argyle Place, TempleTerrace, FL 33617 [Email: commonpurpose@serve.com

Florida's long growing season and abundant moisture produces high biomass yields. Tree species and potential oven-dry annual yield includes: 8.9 ton per acre for cottonwood (*Populus deltoides*), 10.3 for closely-spaced slash pine (*Pinus elliottii*), 12.0 for leucaena (*Leucaena spp*.), 11.2 for intensively managed

Eucalyptus amplifolia in north Florida, and 16.1 for *Eucalyptus* grandis in central and south Florida. Flatwoods and reclaimed phosphate land are well suited to grow SRWCs. Thousands of acres of land, with low opportunity cost, are potentially available. Opportunity cost for land is estimated to be $35-$60 per acre in the north and west, and $15-$25 in central and parts of south Florida. A potential use for SRWCs is co-firing with coal in existing power plants. A recently completed feasibility study at Lakeland Electric, estimated a cost, including production, harvest and transportation, of $1.76 per mm Btu for *Eucalyptus* grandis and $1.73 for leucaena. Harvest cost was estimated to be more than 60% of total cost. Two successful test burns have been completed, one at Lakeland Electric's McIntosh Plant, and the other at Tampa Electric's Gannon Plant.

Coppice Effects on Willow and Hybrid Poplar Stem Attributes and Biomass Production

P.J. Tharakan, C.A. Nowak, L. P. Abrahamson, D. J. Robison, J. G. Isebrands, T. A. Volk and *E. H. White*, State University of New York College of Environmental Science and Forestry, 1, Forestry Drive, Syracuse, New York, 13210 [Phone: (315) 470-4742 E-mail: pjtharak@mailbox.syr.edu]

Coppice short rotation intensive culture systems (SRIC) are being established over large areas in different parts of the world for the purpose of producing pulpwood, fuel, bioproducts or firewood. After establishment of the root system, the above ground portion of the trees is cut back to produce vigorous growth through a flush of multiple stems. Coppice systems are known to exhibit superior biomass production potential, which is primarily attributed to efficient photosynthate transport between root and shoot, rapid occupation of land through high leaf area deployment, and early bud break and late leaf senescence, resulting in a more efficient use of the growing season. While willows (*Salix* spp.) and hybrid poplars (*Populus* spp.) respond well to coppicing, differences may be expected in coppicing potential, and post coppice growth patterns, including biomass production. Although some studies have analyzed the phenomenon of coppicing and the associated biomass production potential in willow and hybrid poplars, little has been reported on their differential response to coppicing. In addition, it is of practical interest to study the changes in stem morphology through which post coppice growth vigor is expressed. A coppice rotation system selection trial of 38 poplar and willow clones was established in central New York State (NY) in 1997. In December 1997, at the end of the first growing season, the trees were cutback at 2-5 cm off the ground to promote coppice regrowth. A suite of tree dimension variables (diameter, height and number of stems), and stool biomass was monitored in 1997 and 1998. This paper presents an analysis of the effect of coppicing on individual stem dimensions, number of stems and stool biomass production, for willow and hybrid poplar clones and identifies the specific attributes that best explain the variation in post coppice biomass production rates.

Sustainability of High Intensity Forest Management with Respect to Water Quality and Site Nutrient Reserves

Virginia R. Tolbert, Bioenergy Feedstock Development Program, Oak Ridge National Laboratory, Oak Ridge TN 37831-6422, [Email: tolbertvr@ornl.gov], *Carl C. Trettin*, Center for Forested Wetlands Research, U.S. Forest Service,

Charleston, SC 29414 [Email: trettinc@cofc.edu], *Dale W. Johnson*, Biological Sciences Center, Desert Research Institute, Reno, NV 89512-1095 [Email: dwj@dri.edu], *John W. Parsons*, Department of Agricultural and Biological Engineering, North Carolina State University, Raleigh, NC 27691-7625 [Email: parsons@eos.ncsu.edu] and Allan E. Houston, Ames Plantation and University of Tennessee, Grand Junction, TN 38039-0389 [Email: ahouston@lunaweb.net]

Plot- and catchment-scale research, models, and meta-analyses are addressing nutrient availability, site quality, and measures to increase short-rotation woody crop (SRWC) productivity and site sustainability. Plot-scale (0.5) research began in 1995 in MS, AL, and TN to compare woody and agricultural crops. In 1997, the study scale expanded to catchment-scale (20-40 ha) SRWCs plantings on International Paper lands in SC. Water quality, erosion, runoff, soil quality, and nutrient cycling are being quantified with production of SRWCs. Combined literature, meta-analyses, field data, and models (NuCM and WATRCOM) are identifying mechanisms to enhance soil carbon, fertilizer and water-use efficiency, and site sustainability, while minimizing nutrient and soil losses. Data and literature analyses demonstrate that soil cover, rates and timing of nutrient application, rainfall timing and intensity, and plant growth are keys to minimizing runoff, erosion, and nutrient transport while maximizing productivity. In SC, decreases in soil water potassium and phosphorus are indicative of previous agricultural fertilization; while increased extractable aluminum reflects increasing site acidification. Modeling simulations and water level management at the SC site are demonstrating mechanisms to enhance tree growth.

Soil Carbon Pool in a Short-Rotation Willow (*Salix dasyclados*) Plantation Four Years After Establishment

F. Ulzen-Appiah, R.D. Briggs, L.P. Abrahamson and *D.H Bickelhaupt*, State University of New York College of Environmental Science and Forestry, One Forestry Drive, Syracuse, New York 13210

Soil carbon (C) pools, i.e., whole soil (WSC), and particle size fractions; sand (SaC), silt (SiC), and clay (ClC), within 0-60 cm soil depth of willow [*Salix dasyclodos* (SV 1)] short rotation intensive culture (SRIC) plantation were compared with adjacent non-woody vegetation (control) plots four years after plantation establishment. The sites had similar management history and by assumption similar soil C levels prior to plantation establishment. Particle size fractions were obtained using physical fractionation procedures. Carbon, determined by wet oxidation, did not differ significantly ($P > 0.05$) between willow and non-woody vegetation plots in concentration (g/kg), mass (g C/kg fraction), and enrichment (E = % fraction C/% soil C). We hypothesized that SRIC systems could impact soil organic matter (SOM) pools differently. The general increasing trend for pool C concentration was SaC < WSC = SiC < ClC and for mass SaC < ClC < SiC. Sand was C depleted whilst silt and clay were C enriched. We conclude that four years of tree presence maintained or caused no decline in initial soil C pools.

"Keywords:" Carbon concentration; Carbon mass; Carbon enrichment; Willow (*Salix dasyclados*); Short-rotation intensive culture.

Results of a Species Selection Trial on the Jobs Plateau, Nigeria

Timothy Volk, Faculty of Forestry, 133 Illick Hall, SUNY ESF, *Andrew Kidd*, University of Hohenheim, Stuttgart, Germany and *Philip Godwill*, Plateau State Afforestation Program, Jos, Nigeria

Reforestation efforts on the Jos plateau in Nigeria were revived in the late 1980s with efforts focused on raising and distributing *Eucalyptus camaldulensis* seedlings. The current study screened 38 species and provenances of *E. camaldulensis* that may be useful for reforestation and agroforestry efforts. Trees were planted on three marginal sites in the region. Survival and height measurements were taken after each of the next three rainy seasons.

Survival was similar on all three sites – Kai was 39.2 $\pm$ 8.0%, Wereng was 40.5 $\pm$ 5.4%, and Fobur was 56.8 $\pm$ 8.1%. Height growth varied significantly across the three sites. It was lower at the tin mine spoil site - Wereng (26.3 $\pm$ 3.8cm) - compared to the other two sites - Kai (76.3 $\pm$ 17.0) or Fobur (83.8 $\pm$ 16.7). Height growth of the introduced provenances of *E. camaldulensis* was dominant on the non-tin mine spoils sites. *Acacia auriculiformis* and *A. holosericea* at Fobur and Kai respectively had height growth similar to the local provenance of *E. camaldulensis*. Results indicate that other species can be established as successfully as *E. camaldulensis* on these sites; however, the success of each species varies from site to site.

The Salix Consortium's Willow Biomass Program: A Status Report

Timothy Volk and *Larry Abrahamson*, State University of New York College of Environmental Science and Forestry

Over twenty organizations have teamed up to facilitate the commercialization of willow biomass crops as a renewable feedstock for bioenergy and bioproducts that produces multiple rural development and environmental benefits. The Consortium is pursuing the quantification and application of some of these benefits including:

1. quantification of changes in soil carbon,
2. phytoremediaition of contaminated sites,
3. avian and soil microarthoropod diversity,
4. using willows as nutrient filters in riparian zones and other systems,
5. application of biosolids on willow biomass crops,
6. development of living willow snow fences,
7. willow for pulp and bioproducts,
8. willow and poplar plantings as an alternative cover for landfills

Over 500 acres of willow have been planted in New York State. The recent introduction of the Step planter has increased the planting rate from 0.5 acres/hr to 2.5 acres/hr. The first commercially harvested material, scheduled for 2001/2002, will be co-fired with coal at the Dunkirk power plant. Continuing research gains in crop yields, reductions in production costs, and the quantification and valuation of environmental and rural development benefits, will be essential to the establishment of a commercial willow biomass enterprise.

Keywords: Salix, short rotation woody crops, co-firing, rural development

Herbicide Screening Trial for Willow Biomass Crops: Applied at Pre-Emergence and Post-Emergence

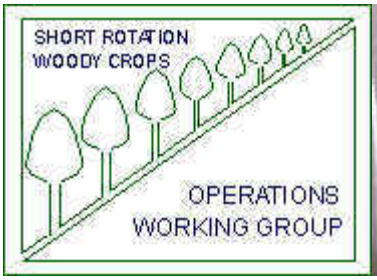
Jason Wagner, Chris Nowak, and *Larry Abrahamson,* State University of New York College of Environmental Science and Forestry

Control of weeds in the first growing season is essential for the successful establishment of woody biomass plantations. Currently, few herbicides are available due to labeling restrictions and broad phytotoxic susceptibility of willows and poplars. Two studies were conducted to explore the phytotoxic effects of six different pre-emergent herbicide treatments, (using both labeled and unlabeled herbicides) to find more viable weed control options. Currently, oxyfluorfen (Goal 2XL) is our standard pre-emergent herbicide used in biomass plantations and served as a reference to evaluate the other herbicide treatments.

In the first study twelve herbicide treatments, consisting of six different herbicides and two controls, were applied to one poplar and seven willow cultivars directly after planting in the spring of 1999. Percent covers of non-crop vegetation, phytotoxicity, survival, number of stems and wood production were measured. Azafenidin (Milestone 4 oz/acre), diuron pendimethalin (Karmex Prowl) mix, imazaquin (Scepter 70DG 2 oz/acre) and the imazaquin pendimethalin mix were comparable in terms of wood production of oxyfluorfen. The ineffectiveness of weed control for diuron and imazaquin (1 oz/acre) and the phytotoxic damage of the sulfometuron (Oust), sulfometuron azafenidin mix and azafenidin (8 oz/acre) led to reduced wood production.

The second study used the same research design, at the same field site with a subset of the herbicide treatments and was applied 30 days after planting. Azafenidin and both rates of oxyfluorfen had significantly higher wood production than the untreated control, while sulfometuron, diuron and imazaquin were not significantly different from the untreated control. All treatments achieved weed control but showed significant phytotoxic damage. Azafenidin and oxyfluorfen treatments were able to recover quickly without a serious loss in growth.

Key words: Post-flush, weed control, phytotoxicity, Salix, Populous.



Third Biennial Conference

Short-Rotation Woody Crop Operations Working Group

Preliminary Agenda

Tuesday, October 10

4:00-6:00 p.m. **Registration and Reception**

Wednesday, October 11

8:30 a.m. **Opening and Welcome-** *Edwin White,* Dean of Research, SUNY ESF and *Vic Ford,* Chair, Short-Rotation Woody Crops Operations Working Group

8:45-10:05 **Technical Session: Overview of SRWC Programs**
Moderator: *Lynn Wright*

The Short Rotation Woody Crops Cooperative Research Program, *Mark D. Coleman*, USDA Forest Service
Short Rotation Woody Crops Cooperative ResearchProgram Experiment A: Fundamental Controls of Growth and Productivity, *David R. Coyle* and *Mark D. Coleman*, USDA Forest Service
Short Rotation Woody Crops for Florida, *James A. Stricker,* University of Florida Polk County Cooperative Extension Service; *Gillian R. Alker, Donald L. Rockwood* and *Douglas R. Carter*, University of Florida School of Forest Resources and Conservation; *Gordon M. Prine*, University of Florida Agronomy Department; *Stephen A. Segrest*, The Common Purpose Institute
The Salix Consortium's Willow Biomass Program: A Status Report, *Timothy Volk* and *Larry Abrahamson*, SUNY ESF

10:05-10:30 **Poster Session and Break**

The Development of a Small Scale Combined Heat and Power Plant Using Down Draft Gasification, *W. Malcolm Dawson*, Applied Plant Science Division, Development of Agriculture and Rural Development Northern Ireland, and *John Gilliland*, Rural Generation Ltd, Brook Hall Estate
The Effect of Clonal Mixing and Planting Density on Herbivory by the Blue Willow Beetle *Phratora vulgatissima* (Coleoptera: Chrysomelidae), *Alan C. Bell, Sam Clawson* and *Alistair R. McCracken*, Department of Agriculture and Rural Development, Northern Ireland
Initial Results of a Species Selection Trial on the Jos Plateau, Nigeria, *Timothy Volk*, SUNY ESF, *Andrew Kidd*, University of Hohenheim, Stuttgart University, Germany, and *Philip Godwill*, Plateau State Afforestation Program, Nigeria
Kraft Pulp from Plantation-Grown Biomass Willow, *Hannu P. Makkonen, Stephen G. Granzow* and *Emmett S. Cheshire*, Empire State Paper Research Institute at SUNY ESF
Mesa Reduction Engineering and Processing, Inc., *Matthew McArdle*, Mesa Reduction Engineering and Processing, Inc., Skaneateles, NY
Growth and Survival of Hybrid Willow and Poplar: Case Study- Schenectady, NY, *David M. McMillan*, Natresco and Associates, Ltd., *Brent E. Weesner, Robin Wilcox*, General Electric Company, Schenectady, NY, and *Timothy A. Volk*, SUNY ESF
Effects of Short-Rotation Forestry Site Preparation Techniques on Soil Mite Communities, *Maria A. Minor* and *Roy A. Norton*, SUNY ESF
Coppice Effects on Willow and Hybrid Poplar Stem Attributes and Biomass Production, *P.J. Tharakan, C.A. Nowak, L. P. Abrahamson, T. A. Volk, E. H. White*, SUNY ESF, *D. J. Robison*, Department of Forestry, North Carolina State University and *J. G. Isebrands*,USDA Forest Service, North Central Experiment Station

10:30-Noon **Technical Session: Overview of SRWC Programs(cont.)**
Moderator: *Bryce Stokes*

Plantation and Management of Short Rotation Woody Species for Biomass Production for Wood Energy in Bangladesh, *M. Faizuddin*, Bangladesh Forest Research Institute
The Swedish Case: A Commercial Introduction of SRC in a Large Scale Experience and Conclusions, *Gustav Melin*
Practical Experiences with the Flevo Project in the Netherlands, *Leen Kuiper*, Institute of Forestry and Forest Products, The Netherlands
Willow Biomass Production in Southern Quebec: Potential, Problems and Future Perspective, *Michel Labrecque, T.I. Teodorescu* and *V. Vujanovic*, Institut de Recherche en Biologie Vegetal, Quebec

Noon **Lunch**

1:00-2:45p.m. **Technical Session: Management and Economics of SRWC**
Moderator: *Bruce Hartsough*

Alternative Scenarios on SRWC as a Fiber Source for Pulp, *Alexander N. Moiseyev*, European Forest Institute, and *Peter J. Ince*, USDA Forest Products Laboratory
Regional Costs of Production of SRWC: Southeastern, Northeastern and Pacific Northwest Regions of The United States, *Mark Downing,*Oak Ridge National Laboratory
An Economic Application of Agroforestry in Saskatchewan, *Rhonda N. Lindenbach-Gibson*, The Centre for Studies in Agriculture, Law and the Environment
Poplar Silviculture: Converting from Pulp Logs to Saw Logs, *James A. Eaton*, Potlatch Corporation Hybrid Poplar Program

Hybrid Poplar Establishment and Production on CRP Land in Minnesota, *Dean A. Schmidt* and *Amy K. Shogren*, WesMin RC&D; *Mark Downing*,Oak Ridge National Laboratory

2:45-3:15 **Poster Session**

3:15-4:30 **Technical Session: Management and Economics of SRWC (cont.)**
Moderator: *Vic Ford*

Delimbing Hybrid Poplar Prior to Processing with a Flail/Chipper, *Bruce R. Hartsough*, University of California- Davis; *Raffaele Spinelli*, Wood Research Institute, National Council for Research, Italy; *Steve J. Pottle*, Boise Cascade Fiber Farm
Planting and Harvesting Willows: A New York State Experience, *Daniel J. Aneshansley* and *Roger A. Pellerin*, Department of Agricultural and Biological Engineering, Cornell University
Herbicide Screening Trial for Willow Biomass Crops: Applied at Pre-Emergence and Post-Emergence, *Jason Wagner*, *Chris Nowak*, and *Larry Abrahamson*, SUNY ESF
Problems of Rust (*Melampsora epitea* Var. *epitea*) on Short Rotation Coppice (SRC) Willow, *Alistair R. McCracken* and *W. Malcolm Dawson*, Applied Plant Science Division, Department of Agriculture and Rural Development Northern Ireland
Yield Responses of Growing Inter and Intra Species Mixtures of Willow in Short Rotation Coppice (SRC), *Alistair R. McCracken* and *W. Malcolm Dawson*, Applied Plant Science Division, Department of Agriculture and Rural Development Northern Ireland

5:00-6:00 **SRWC OWG Business Meeting**

Thursday, October 12

8:00a.m.-5:00p.m. **Field Tour**

- Tour of willow biomass research trials including breeding and selections trials, coppicing trials, and clone site trials.
- Planting equipment for willow and poplar biomass crops.
- Wood processing equipment.
- Wine tasting in the Finger Lakes Region.

6:00-8:00 **Dinner in Scenic Finger Lakes Region**

Friday, October 13

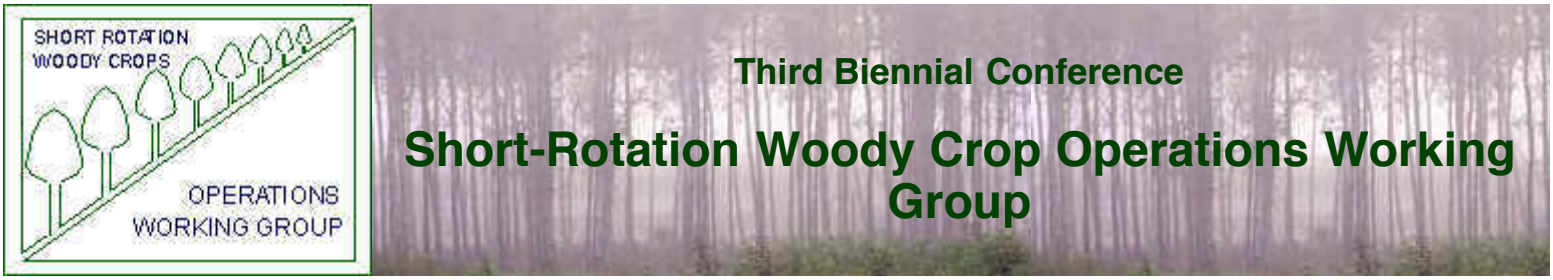
8:00a.m.-10:00 **Technical Session: Uses for SRWC**
Moderator: *Mark Coleman*

Establishing Willow and Poplar on a Brownfield Site in Utica, NY, *Sam Jackson* and *Chris Nowak*
Phyto-Monitoring for Accelerated Growth of Bio-Fuel Production, *Sharon Yehezkeli* and *Roy Merritt*, Natafim
Phytoremediation of TCE in a Shallow Alluvial Aquifer: A Field Demonstration, *Gregory J. Harvey*, US Air Force
Alternative Scenarios on SRWC as a Fiber Source for Pulp, *Alexander N. Moiseyev*, European Forest Institute; *Peter J. Ince*, Timber Demand and Technology Assessment, Forest Products Laboratory
Percolation Reduction Using Short Rotation Woody Crops: Case Study- Schenectady, NY, *David M. McMillan, Donald J. Hughes*, Natresco and Associates, Ltd., *Brent E. Weesner* and *Robin Wilcox*, General Electric Company, Schenectady, NY

10:00-10:30 **Break**

10:30-11:30 **Technical Session: Sustainability of SRWC**
Moderator: *Mark Downing*

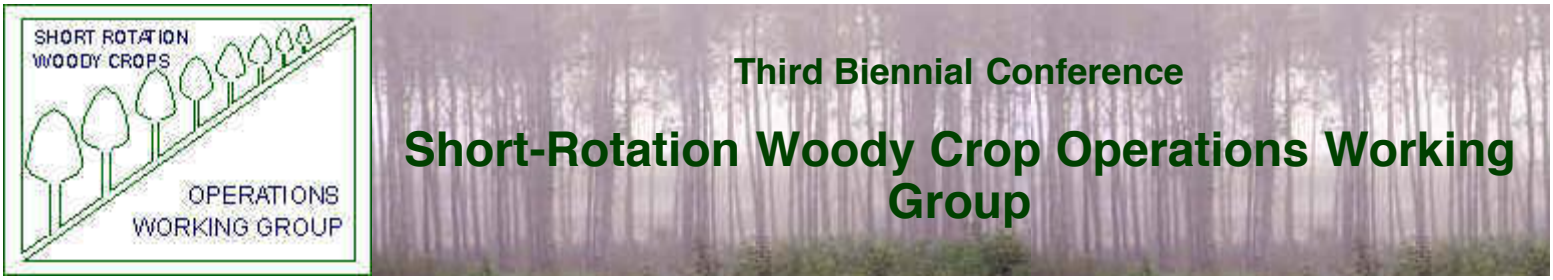
Birds Breeding in Short-Rotation Woody Crops in New York: 1998-2000, *Andre A. Dhondt* and *Keila V. Sydenstricker*, Laboratory of Ornithology, Cornell University
Sustainability of High Intensity Forest Management with Respect to Water Quality and Site Nutrient Reserves, *Virginia R. Tolbert*, Bioenergy Feedstock Development Program Program, Oak Ridge National Laboratory; *Carl C. Trettin*, Center for Forested Wetlands Research, US Forest Service; *Dale W. Johnson*, Biological Sciences Center, Desert Research Institute; *John W. Parsons*, Department of Agricultural and Biological Engineering, North Carolina State University; *Allan E. Houston*, Ames Plantation and University of Tennessee
Soil Carbon Pools in Short Rotation Willow (*Salix dasyclados*) Plantation Four Years after Establishment, *F. Ulzen-Appiah, R.D. Briggs, L.P. Abrahamson*, and *D.H. Bickelhaupt*, SUNY ESF



Call for Papers and Presentations

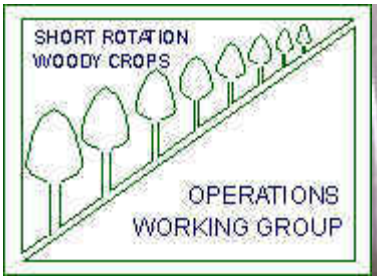
Some spaces are still available for presentations. Send abstracts immediately to Timothy Volk. Abstracts should be in Microsoft Word '95 format with Times New Roman font size of 12. Abstracts should be brief and informative and follow these guidelines:

- Body of the abstract not to exceed 175 words
- Title should be boldface uppercase and centered
- Author(s) listed by first name, middle initial, last name; centered with presenters name boldfaced
- Indicate affiliation, address, zip code and e-mail address; italicized and centered
- Left justified text body with 1.5 inch margins



Directions

The Wyndham is just off Exit 35 of the New York State Thruway. From Exit 35, enter Carrier Circle and go most of the way around the circle to Route 298 East. Drive about ¼ mile on Route 298. The Wyndham is on the left at 6301 Route 298 East



Third Biennial Conference

Short-Rotation Woody Crop Operations Working Group

October 10-13, 2000
Syracuse, New York

Hosted by
State University of New York
College of Environmental Science and Forestry

Sponsored by
NCASI
US DOE Oak Ridge National Laboratory
USDA Forest Service
Electric Power Research Institute
New York Center for Forestry Research and Development
Short Rotation Woody Crops Program at SUNY-ESF
IUFRO Working Unit 1.09.00

In a mutually beneficial and collaborative fashion, the USDA Forest Service, DOE's Oak Ridge National Laboratory (ORNL), and the Electric Power Research Institute (EPRI) established the SRWC Operations Working Group (SRWC OWG) in 1995 to pursue the efficient development of practices and equipment to culture, harvest and handle large-scale woody biomass plantations. The Group's mission is to promote collaborative efforts in developing needed operations for SRWC plantations that comply with the principles of economic viability, ecological soundness and social acceptance. The third biennial conference of the SRWC OWG will contribute to that mission by touring woody crop field trials, viewing the operation of planting and processing equipment, and providing a forum for the exchange of ideas and information between practitioners, researchers, policy makers, landowners and other interested parties.

Topics that will be discussed include:

- Operations management, research and development, including: site preparation, irrigation, weed management, nutrient management, planting, breeding and clonal selection, pest management
- Harvesting and processing of SRWC for various products
- Using SRWC for multiple benefits, including: phytoremediation, wastewater treatment, nutrient management, erosion control, wildlife
- Environmental benefits associated with SRWC
- Economic and policy considerations related to SRWC

Proceedings
Complete written papers must be submitted at the time of the conference for publication in the conference proceedings. Guidelines for paper submissions will be circulated to authors on receipt of abstract.

Location
Wyndham Syracuse Hotel, Syracuse, NY.

Accommodations
We have reserved a block of rooms at the Wyndham Syracuse at $99 for conference participants. You must specify that you will be attending the "National Short-Rotation Woody Crop Group" meeting when you register and request the appropriate rate. A $75 per night government rate is available for government employees - valid government ID must be presented at check-in. Reservations may be made by calling 315-432-0200. Cut-off date is September 19, 2000.

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SHORT-ROTATION WOODY CROPS OPERATIONS WORKING GROUP THIRD BIENNIAL CONFERENCE

INSTRUCTIONS TO AUTHORS- MANUSCRIPTS

DEADLINE FOR SUBMISSION: November 30, 2000. If your paper is not received by this time, only your abstract will appear in the conference proceedings.

Submission: Authors are required to submit an electronic copy and a hard copy of their initial and final papers. Please note that submitted papers will not be edited for grammar or content. Conference organizers will be responsible for formatting documents into conference proceedings. Submit your paper to:

Tim Volk
133 Illick Hall
SUNY-ESF
Syracuse, NY 13210

INSTRUCTIONS FOR AUTHORS

Software: The preferred file format is Microsoft Word (Windows) software for all phases of paper development, including page layout, tables, figures and graphs, and drawings. Other acceptable formats include Rich Text Format and WordPerfect, version 6.1 and earlier. If images are used in the paper, a separate image file should be provided in a PCX, WMF, JPEG or GIF formats. If the Macintosh platform is used, please ensure that the file can be converted for use in Windows.

Fonts: Use Times New Roman regular, 12-point size (these instructions have been developed using this specification). If Times New Roman is not available, please use a 12-point font size with a serif style.

Margins: All papers should be page formatted for 8.5 by 11 inch, portrait paper size. Use 1.5 inches left, and 1-inch right, bottom, and top. Use word processing page breaks rather than repeated returns to set page breaks.

Pagination: Do not include page numbers. Pagination will be added once your paper is combined with the proceedings. Mark the page numbers on the hard copy of your paper provided with the electronic version.

Paper Length: Maximum length of 10 printed pages, including diagrams, references, and tables.

Language: English

Title: On the first page of the paper the title should be **CAPITALIZED, BOLDED,** and **CENTER-JUSTIFIED.** Use the word processing feature to center justify the title rather than spaces, tabs, or indents. Begin the title with a word useful for indexing and information retrieval (e.g., not "Effect" or "New").

Author Name(s) and Affiliation(s): Two lines (skip one line) after the title, author name(s) and affiliation(s) should be added using Initial Capitals and Center Justification. The affiliation of each author should include a short address with city, state, country, and postal or zip code. The affiliation should follow the author's name by two lines (skip one line). Use the word-processing feature to center justify the author names and affiliations rather than spaces, tabs, or indents.

Abstract: A short abstract (less than 200 words) should follow the names and affiliations of the authors. Write the abstract so that useful, factual information is transmitted to the reader. Objectives, methods, and results should be summarized. Begin with the word "**ABSTRACT" (bolded)** centered justified two lines after the author affiliations. Begin the text for the abstract two lines following the subtitle. The abstract should be left justified. Use your word processing software to set the justification.

Keywords: Keywords should be added at the end of the abstract paragraph on a new line. Begin with the heading

"**Keywords:" (bolded).**

Text Format: All paragraphs should be single-spaced with a space between paragraphs. All paragraphs should be left justified. Do not use indentations. Use a return at the end of the paragraph. **Do not use returns at the end of every line.**

Headings: First level headings should be CAPITALIZED AND CENTER-JUSTIFIED.

Second level headings should be Initial Capitalized, Left justified, and Underlined. Third level headings should be placed at the start of a paragraph with Initial Capitals followed by a period (.), then two spaces before the text of the paragraph.

Equations: Double-space between text and equations, and center justify equations on the page using your word processing feature. Number equations consecutively. Equation numbers should be in parentheses and placed flush right. If the equation crowds the right margin, place the reference number on the line below the equation. Spell out the word equation if it begins a sentence. Define all symbols used in the equation, and avoid abbreviations. If the equation cannot be generated by your word processor, provide a separate graphic file and/or a hard copy of the equation on a separate sheet of paper.

Tables: Any tables should appear within the text as soon after referenced as possible. Double-space before and after tables. A table title should be left justified one line above the table with Initial Capitals. Do not indent table titles. Use your word processing software to generate tables. Use small lower case letters starting with "a" to indicate table footnotes. Left-justify all table footnotes directly below the table.

Figures: Any figures should appear within the text as soon after referenced as possible. Double-space before and after the figure and after the caption. Figures must be sized to fit the page margin requirements described above. Center justify the caption below the figure using your word processing justification feature. Do not use spaces or tabs to center the captions. Use Initial Capitals for the Caption. Spell out "Figure" if beginning a sentence and at the start of the caption, followed by its sequential Arabic number, a period (.), and then two spaces. If the figure cannot be inserted into the paper using your word processing software, provide a separate graphic file and/or a hard copy of the equation on a separate sheet of paper. Figures must be included within the 10-page limit, unless payment is provided as stipulated above.

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Units: Use SI units followed by English or Standard units in parenthesis in the text; e.g., 1 kilogram (2.2 pounds). For tables and figures, provide both SI and English units if the size of the table or figure permits placement.

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> Fishbein, F. F. and J. D. Hardie. 1996. Pitch canker in New Zealand. Journal of New Zealand Forestry 27(3): 27-33.

References should be listed in alphabetical order. The References section should be the last section of the paper. The

REFERENCES heading should be CAPITALIZED AND CENTER-JUSTIFIED.

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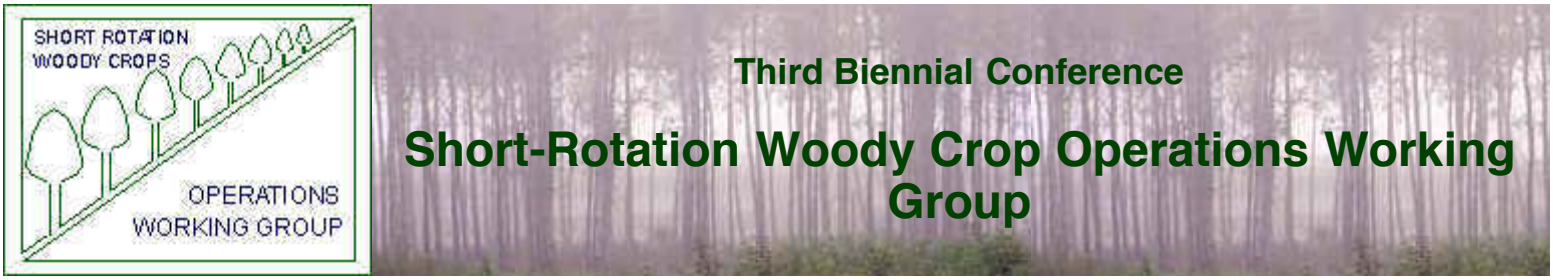

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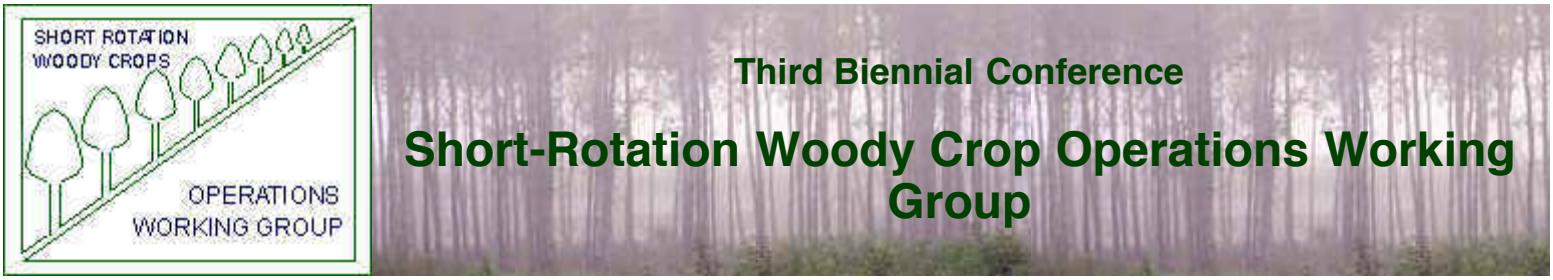

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