

BIOMASS POWER FOR RURAL DEVELOPMENT

TECHNICAL PROGRESS REPORT PHASE-II

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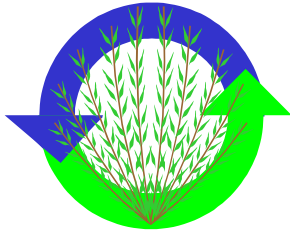
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THE SALIX CONSORTIUM

PROGRESS HIGHLIGHTS: Third Quarter 1998

Feedstock Production and Infrastructure (Task 1)

- Willow planted on the Consortium's demonstration plots planted in spring of 1998 have grown well. As anticipated, weed growth presented the single most significant challenge. An effective combination of chemical and mechanical weed control was employed to maintain control. Efforts are ongoing in this area to determine the most economic and biologically effective means of monitoring and controlling weeds.
- Site preparation for the 1999 planting sites continued during this period. Approximately 80 ha (200 ac) were plowed and disked in western New York. This acreage has been secured using revised site selection criteria which includes larger plot sizes. These criteria are aimed at lowering costs and increasing productivity.
- Consortium staff continued site visits for identifying acreage for additional commercial scale plots. Six new potential sites were evaluated and informational packets were sent to eleven interested landowners.

Power Plant Conversion and Testing (Task 2)

- Retrofit activities at Dunkirk continued during this period. Silo storage was ordered and plant staff began rerouting pneumatic transport lines. Biomass sizing equipment has been specified and was ordered. The station is expected to be ready for shakedown tests late in the first quarter of 1999.
- The Vermont gasification project produced gas from wood and corn. Many mechanical modifications were made to improve the systems performance and fuel handling. The Consortium still intends to test willow in the system sometime next year.
- Greenidge station continues to operate at a 10% cofiring rate using biomass residues.

System Optimization and Experimental Studies (Task 3)

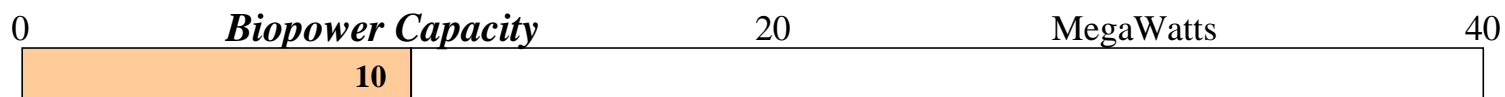
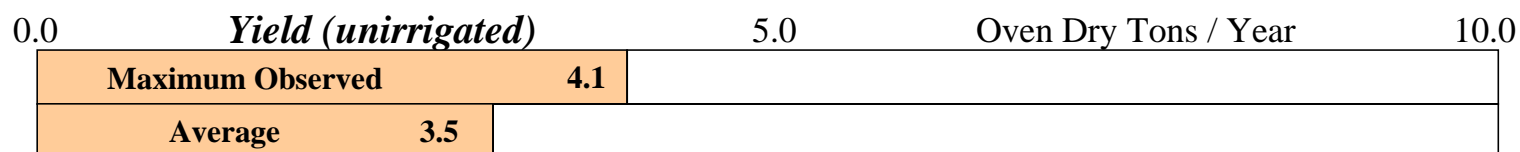
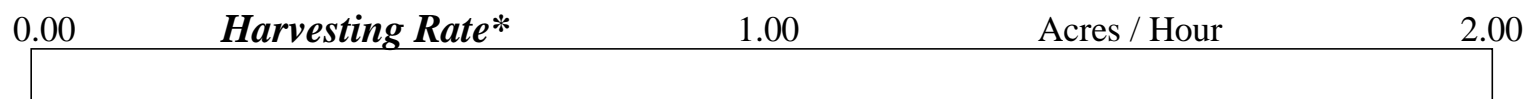
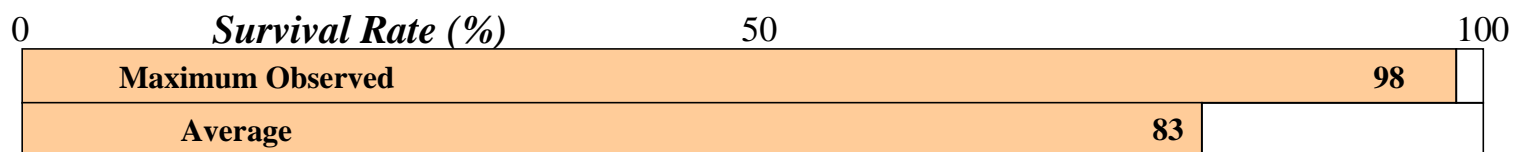
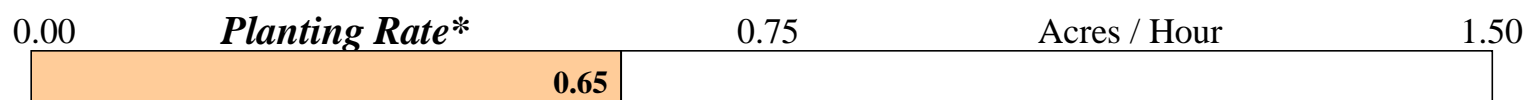
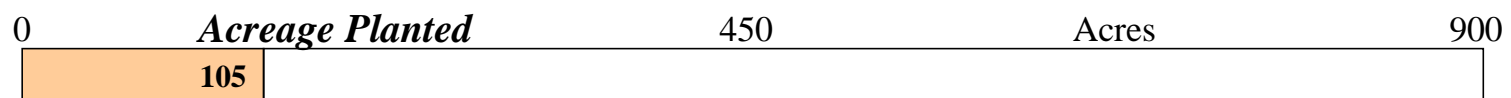
- Ten seedlings each from 78 families will be the focus of a new genetic study. The objectives of the study are to obtain basic information on inheritance pattern of various traits and to develop a system for identifying superior willow clones at a young age. The results of this study may reduce crop improvement costs by reducing R&D efforts spent on less promising clones.
- Research efforts on willow root growth continued during this reporting period. In July, minirhizotrons were inserted into the soil in a four-year-old willow trial at Tully. The study focuses on root production and turnover and will continue through the 1999 growing season. The results of this study will be important to answering carbon sequestration questions and confirming estimates of below ground biomass in willow.

- Cornell University's Laboratory of Ornithology released an interim report on its study of avian biodiversity in willow plots. The report is provided in Appendix C. This research is a key component of the Consortium's efforts to evaluate the environmental effects of a large scale willow energy enterprise. The data collected indicated a zero presence of cow birds (a pest species).
- Willow trials were planted on three sites along the Erie Canal in Utica, NY. Other potential trial sites were visited in Pennsylvania (Roarding Branch, Homer City), New Jersey (Bayside Prison), and Maryland (Delmarva Peninsula).
- Tests with a disc mower for first year coppicing operations were unsuccessful. Other types of equipment, such as modified sickle bar mower and corn choppers, are being pursued. An optimized system will be required to minimize coppicing costs and reduce the risk of damage to the willow.

Enterprise Development (Task 4)

- Approximately 40 people attended the Willow Biomass Field Days. Participants at this years event were much more interested in how they could become actively involved in the development of willow biomass crops.
- Preparations are ongoing for October's community meeting. Two sessions are scheduled for October 28th at the Fredonia Masonic Lodge. The Consortium mailed 132 personal invitations.
- Leaders from the Consortium met with U.S. Assistant Secretary Dan Reicher and New York Congressman Sherwood Boehlert in Utica.
- Articles about the project and the upcoming community meetings were published in several newsletters and a magazine. A full length feature article with photos was published in local daily newspapers with a circulation of approximately 45,000. These press releases resulted in a number of new leads for more demonstration acreage and project participation.
- Additional data was collected for the Consortium's business and economics model. When completed, the model will provide valuable information about the value of willow energy crop enterprise.

Progress Towards Consortium Goals: September 1998

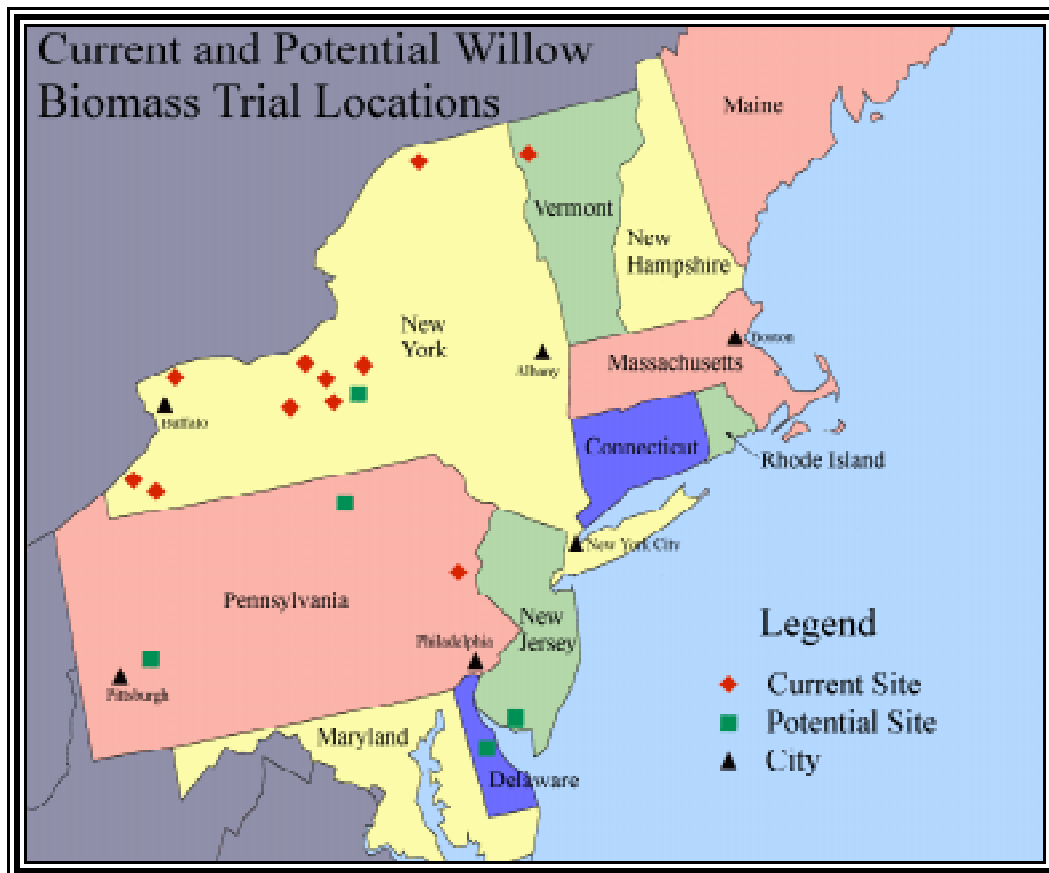


** Maximum Rate Observed*

1.0 INTRODUCTION

The project undertaken by the Salix Consortium is a multi-phased, multi-partner endeavor. Phase I focused on initial development and testing of the technology and forging the necessary agreements to demonstrate commercial willow production. The Phase I objectives have been successfully completed: preparing final design plans for two utility pulverized coal boiler for 20 MW of biopower capacity; developing fuel supply plans for the project with a goal of establishing 365 ha (900 ac) of willow; obtaining power production commitments from the power companies for Phase II; obtaining construction and environmental permits; and developing an experimental strategy for crop production and power generation improvements needed to assure commercial success. The R&D effort also addresses environmental issues pertaining to introduction of the willow energy system. Beyond those Phase I requirements, the Consortium has already successfully demonstrated cofiring at Greenidge Station and has initiated development of the required nursery capacity for acreage scale-up. This past spring, 43 ha (105 ac) of willow were planted and another 91 ha (225 ac) were prepared for planting in 1999. Exhibit 1-1 shows the locations of various Consortium activities. Not shown are Consortium activities in Rhinelander Wisconsin.

Exhibit 1-1: Location of Consortium Activities



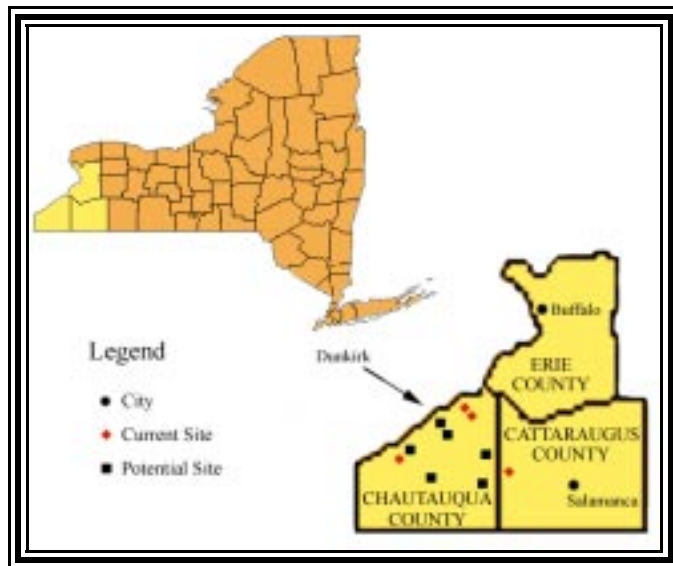
In Phase II every aspect of willow production and power generation from willow biomass will be demonstrated. The ultimate objective of Phase II is to transition the work performed under the Biomass Power for Rural Development project into a thriving, self-supported energy crop enterprise.

1.1 Project Overview

The Salix Consortium pools the research and investment interests of over 14 corporations, associations, universities and regional government agencies in a well orchestrated program to develop a new energy crop enterprise. More than 37 farmers and landowners representing over 3,000 acres of potential willow production have met with Consortium representatives and expressed interest in the new energy crop. Although some of these landowners/growers are too far away to be considered in this demonstration, 22 landowners representing 770 ha (1,900 ac) of land have been screened for participation in the project (Appendix A). From this pool of acreage combined with utility-owned land and other Consortium experimental plots, the availability of 365 ha (900 ac) of willow for energy production is assured in Phase II. The Consortium continues to add to the prospect list of participating landowners through outreach activities.

Consortium regional representation is focused in the Northeast, stretching from Ontario to Pennsylvania and expanding into the midwest. Cofiring tests have been conducted at both Niagara Mohawk Power Corporation's (NMPC) Dunkirk, New York State Electric and Gas' (NYSEG) Greenidge, and GPU's Seward and Shawville power stations. The basic fuel handling system at Greenidge has demonstrated continuous firing at 10% by heat input. An initial test firing of the willow at Greenidge station has already been performed and has provided insight into the issues to be addressed in Phase II to assure efficient use of the willow energy crop. NMPC recently completed successful tests cofiring biomass in one corner of a boiler at its Dunkirk Station. NMPC is now retrofitting this boilers for full-time cofiring. The focus of the Salix Consortium is on energy crop infrastructure and development first and conversion technology second in the belief that the major tasks ahead are to develop an economical crop production infrastructure for the business. Nonetheless, energy conversion issues are effectively addressed in the program and advanced technologies through gasification are included with a realistic timetable for implementation. All of the preceding efforts contribute to the project team's belief that this

Exhibit 1-2: Dunkirk Sites



Consortium will be the *first in the nation to develop an economically and environmentally sustainable business in energy crops for power generation* and ultimately a variety of high value energy products.

To meet this vision, the Consortium has organized its activities into four distinct tasks:

- Task 1 - Feedstock Production and Infrastructure
- Task 2 - Power Plant Conversion and Testing
- Task 3 - System Optimization and Experimental Studies
- Task 4 - Enterprise Development

A brief description of the objectives of each task is provided below.

1.2 Description of Tasks and Goals

1.2.1 Task 1 - Feedstock Production and Infrastructure

Task 1 activities focus on acreage scale-up and willow field production activities. During Phase II, the Consortium will establish 365 ha (900 ac) of willow in New York. To accomplish this, the Consortium will ensure that sufficient planting stock is produced, production sites are prepared, and that planting, monitoring, maintenance, and harvesting activities are developed in a manner consistent with establishing an energy crop enterprise. All planning, land acquisition, and commercial field activity associated with this project are managed under Task 1. A schedule of the Task 1 efforts and corresponding deliverables is provided in Appendix B.

TASK 1 ★ <i>ACREAGE SCALE-UP</i> ★ <i>NURSERY PRODUCTION</i>

1.2.2 Task 2 - Power Plant Conversion and Testing

Task 2 activities focus on resolving issues related to the power plants and conversion of a delivered willow product into electricity. The goals for Task 2 efforts in Phase II include the retrofitting and continuous cofiring of biomass at Dunkirk Station, continued operation and testing of Greenidge Station, and gasification tests using willow at McNeil Station. The Consortium will also collect operational data such as manpower requirements and maintenance costs. However, emissions monitoring and ash testing activities will be managed under Task 3. A schedule of the Task 2 efforts and corresponding deliverables is provided in Appendix B.

TASK 2 ★ <i>PLANT RETROFITS</i> ★ <i>EMISSION MONITORING</i>

1.2.3 Task 3 - System Optimization and Experimental Studies

All research and development activities are managed under Task 3. This includes willow feedstock and production system R&D, environmental and sustainability studies, and power generation optimization efforts.

Specifically, the Consortium will seek to improve willow yields and pest resistance while maintaining site productivity. The Consortium will evaluate willow site preparation techniques, planting and harvesting equipment. A schedule of the Task 3 efforts and corresponding deliverables is provided in Appendix B.

TASK 3
★ <i>CROP R&D</i>
★ <i>ENVIRONMENTAL STUDIES</i>
★ <i>OPERATION IMPROVEMENTS</i>

1.2.4 Task 4 - Enterprise Development

Task 4 will focus on Business Development and Optimization activities that will lay the foundation for the long term viability of a willow production enterprise. The Consortium will investigate ways to capitalize on existing federal, state, and local government programs to increase

the competitiveness of the crop. Forest management and agricultural tax structures, Conservation Reserve Programs, and eco-enterprise zones are examples of avenues being pursued. These activities plus on-going outreach and technology transfer are aimed at ensuring the successful transition of this project from demonstration to commercialization. A schedule of the Task 4 efforts and corresponding deliverables is provided in Appendix B

TASK 4
★ <i>BUSINESS DEVELOPMENT</i>
★ <i>OUTREACH</i>

1.3 Work Schedule and Deliverables

A complete work schedule and list of corresponding deliverables for each partner is provided in Appendix B. A summary of that schedule is provided below.

2.0 DETAILED TASK PROGRESS REPORTS

2.1 Task 1 - Feedstock Production and Infrastructure

2.1.1 Nursery Operations

Willow growth at the New York State Department of Environmental Conservation Saratoga Tree Nursery, Saratoga Springs, NY, appeared better than in 1997. Improvements to the irrigation system that were installed during 1998 are a likely reason for this result. Mechanical and chemical weed control was completed in cutting orchards established at Saratoga during 1998. Ammonium nitrate fertilizer will be applied to cutting beds established in previous years at the rate of 100 kg-n/ha. Foliage samples were also collected for nutrient analyses.

2.1.2 Acreage Scale-up Activity Dunkirk/Greenidge

Demonstration Site and Field Trial Updates

Trees in the demonstration planting established at Leon, NY, during spring 1998 grew well. The site required mechanical weed control because the herbicide cap provided only partial control. Nutsedge (*Cyperus spp.*) was the primary problem weed. An arrowhead tine cultivator was used for weed control but, it was ineffective. SUNY-ESF's multi-head rototiller, which has proven effective in central New York, was transported to Leon from Tully to complete the task.

Trees in the demonstration planting at Sheridan, NY, grew well, and there was less weed competition than at Leon. Part of the site (14 ha) was treated with fluazifop-P-butyl (Fusilade 2000) at the 0.45 kg ai ha⁻¹ rate to control quackgrass (*Elytrigia repens L.*). Spot-treatments with Fusilade 2000 were completed on an additional 4 ha. The Leon and Sheridan sites had minor foliage damage by flea beetles (subfamily Alticinae). Tree survival in the willow demonstration planting at Pomfret, NY, appeared low and this site will have to be replanted next spring.

Quackgrass was also observed in the demonstration planting established during spring 1998 at Canastota, NY. Fusilade 2000 herbicide was applied at the 0.45 kg ha⁻¹ rate to control the quackgrass.

Site preparation for plantings scheduled for 1999 continued. In western NY, sites in Dayton, Gerry, and Pomfret totaling 80 ha in size were plowed and disced. Winter rye was planted on the Gerry site to reduce erosion and will be planted at Pomfret during October. In central NY, discing was completed on sites that were plowed during August at Lafayette and Tully. Drainage improvements were made on sites in Pomfret, NY, scheduled for planting during 1999. Culverts were installed to facilitate equipment movement on the Pomfret sites.

SUNY-ESF examined potential sites for willow clone-site trials in Delaware and New Jersey. Staff from the Delaware Department of Agriculture Forest Service located a 2 ha site that is currently planted with soybeans and will be prepared for planting next spring. Approximately

half of this field will be used for a willow bioenergy trial, and the other half will be used for switchgrass trials.

SUNY-ESF visited two potential clone-site trial locations in Pennsylvania. Site preparation including herbicide application was initiated at a site near Roarding Branch, PA. The lack of rain and recent mowing of the site raised concerns about the potential effectiveness of the herbicide treatment. A site inspection will be completed in early October by the site co-operator to assess herbicide effectiveness. The site will be plowed this fall and left in that condition over the winter to facilitate drying next spring. The second site was near Homer City, PA. This site will not be planted until 2000 because site preparation could not be completed during fall 1998. The site would have required mowing, raking, and weed re-growth before herbicide application, and it is unlikely that sufficient weed control could have been achieved in time for spring 1999 planting.

SUNY-ESF staff visited four potential sites for willow bioenergy trials at the Bayside Prison in southern New Jersey. Staff from the New Jersey Department of Environmental Protection State Forestry Service discussed the possibility of establishing willow biomass trials with prison staff and arranged the visit. A decision will be made as soon as possible on the best location for the trial.

Staff from SUNY-ESF, NYSEG, and ANTARES visited Delmarva Power Company's Indian River Power Plant to discuss cofiring opportunities and the potential of establishing willow biomass trials in the area. The Consortium will continue to follow up on this lead in 1999.

Land Acquisition Updates

Staff from the SoCNY RC&D, SUNY-ESF, and FORECON inspected four sites planted in the spring of 1998 and evaluated six new potential sites. SoCNY RC&D also sent information packets with land questionnaires to eleven other interested landowners.

2.1.3 Acreage Scale-up Activity Other Sites

Burlington Electric Department trial plots continue to show excellent growth. Additional data will be presented in the next progress report.

2.2 Task 2 - Power Plant Conversion and Testing

2.2.1 Dunkirk Station

Retrofit activities at Dunkirk continued during this period. Silo storage was ordered and plant staff began rerouting pneumatic transport lines. Biomass sizing equipment has been specified and was ordered. The station is expected to be ready for shakedown tests late in the first quarter of 1999.

2.2.2 Greenidge Station

Although Greenidge station is preparing to be transferred to new owners, biomass continues to be cofired at the plant. The Consortium expects to seek the participation of the new owners in the project during the first half of 1999.

2.2.3 McNeil Station

The VT gasification project produced gas on wood and corn during the summer and fall. Many mechanical modifications were made to improve performance and fuel handling. Wood fuel consists of dried sawmill chips. Pre-parametric tests are scheduled to resume late in December through January.

2.3 Task 3 - System Optimization and Experimental Studies

2.3.1 Willow Feedstock R&D

Genetic Improvement

Seedling growth rates increased dramatically in response to increased fertilizer application and extended photoperiod. These plants will be brought into dormancy during October. Heights of all willow seedlings produced during 1998 by controlled pollination were measured. These measurements will be used to select 20 exceptionally vigorous seedlings per family that will be planted in pots and provided with optimum growing conditions until mid-fall 1998. The seedlings will then be allowed to proceed into dormancy, followed by propagation during winter 1998-1999 using small hardwood cuttings (2 cm in length) in a greenhouse. Rooted cuttings from these plants will be field planted during spring 1999 in a cutting orchard. This is part of an effort to utilize progeny produced by 1998 controlled breeding efforts as quickly as possible.

Ten seedlings per family will be selected at random from approximately 35 *S. eriocephala* families produced by controlled pollination during February 1998 for a detailed genetics study. The objectives of the study are to obtain basic information on inheritance patterns of various traits and to develop a system for identifying superior willow clones at a young age using molecular markers.

Progress continued towards determining chromosome numbers of willows in the SUNY-ESF collection. Willow chromosomes were observed and photographed. Modifications were made to the protocols for producing root tissue used in the system and the chromosome staining procedure. Chromosome numbers have been estimated for several clones and numbers will be reported after all clones of interest have been tested. The small size of willow chromosomes relative to chromosomes of most other plant species has made this project especially challenging. These efforts will aid and advance the Consortium's understanding of willow genetics and make breeding of desirable willow clones easier.

Native willows collected during 1995 and planted in cutting orchards at Tully, NY, were surveyed for insect and disease pests. A small number of *S. eriocephala* clones had shepherd's

crooks. The suspected cause is *Fusicladium spp.*, a fungal pathogen. Foliage damage by a rust fungus was observed on some clones, but damage was minor. Insect feeding damage by at least three beetle species was observed on many clones, but the damage was not considered severe enough to warrant control treatments. These studies are part of the Consortium's ongoing effort to seek native clones that have superior characteristics for use as energy crops.

Growth and light interception measurements continued in the genetic selection trial established at Tully during spring 1997 in cooperation with the USDA Forest Service in Rhinelander, WI. Foliage samples were collected for nutrient analyses and laboratory analyses continued on foliage samples collected during summer 1998. This study will assist in characterizing the ecophysiology of different willow clones. Ultimately this information will be used to breed superior clones.

Nursery Production Improvement

There was no new activity to report this quarter.

Crop Improvement

Measurements scheduled for July 1998 were completed. Sawfly larvae damaged trees for the third time this season and were controlled with carbaryl insecticide. Measurements continued throughout this quarter.

A trial was initiated in 1996 to identify optimum nitrogen fertilization rates for willow bioenergy plantings using existing trials at King Ferry, Somerset, and Tully, NY. Foliage samples were collected for nutrient analyses and weed biomass was measured at each site. These trials will be harvested during winter 1998-1999, enabling verification of biomass estimation equations derived from this study.

SUNY-ESF continued its efforts on a study that was initiated in 1996 to identify organic fertilizers that can be used to increase willow biomass production without causing site quality degradation. Attempts to collect soil water samples using lysimeters in the test plots were unsuccessful during September due to dry soil conditions. Soil water monitoring has been undertaken to determine if leaching of nitrates or phosphates present in the organic amendments occurs. SUNY-ESF will also begin a cooperative effort to mineralization of sewage biosolids and poultry manure study with the USDA Forest Service Northeast Experiment Station in Warren, PA.

Willow trials were planted on three sites along the Erie Canal in Utica, NY. These small trials will assess the potential of using willow for phytoremediation of contaminated soils. Two of the three sites planted in Utica contained dredge spoils from the Erie Canal. The third site was contaminated early in the century by the coal gas industry. These plantings will be monitored for willow growth and changes in levels of polycyclic aromatic hydrocarbon (PAH) contaminants in the substrate.

During this reporting period, insect, disease, and browse survey data collected at all willow demonstration areas were summarized. Deer browse was the most severe problem encountered during 1998. Damage was severe on some sites and large clonal variation in damage incidence was observed. *Salix eriocephala* clones were damaged more severely than other species, but a strong effect of position in a field was observed. Damage typically increased as distance from a road increased. Deer browse damage was most severe in plantings at Lafayette and Leon, NY. Foliage-feeding insects were a severe problem in demonstration plantings at Tully, NY. *Melampsora* rust was observed on several clones, but was not severe on any clone or site. An infestation of sawflies (*Nematus ventralis*) damaged one-year-old willows in the demonstration planting at Tully, NY (planted in 1997). This was the third infestation in this area during 1998. The insects were controlled with carbaryl (Sevin) insecticide. Survival was measured in demonstration areas planted at Tully during 1997 and 1998. These efforts will be important in establishing the optimum mix of clones and placement for maximizing biomass growth and survival.

Foliage sample collection was completed in demonstration plantings that were established during spring 1998 at Lafayette, Leon, Sheridan, Tully, and Wolcott, NY. Analyses of foliar nitrogen, phosphorus, potassium, calcium and magnesium concentrations will be completed on these samples at SUNY-ESF. These data will be combined with similar information obtained in previous years from willow bioenergy trials around New York State and used to develop fertilizer recommendations for willow bioenergy plantings. Laboratory analyses began on soil samples collected during summer 1998 from all of the 1998 demonstration plantings. Mechanical weed control was completed in the demonstration area at Sheridan, NY.

Survival measurements were completed by SUNY-ESF's staff in willow clone-site trials at Somerset (planted in 1995) and Tully, NY (planted in 1993). Mechanical weed control was completed in the willow clone-site trial at Wolcott, NY (planted in 1998) using the multi-head rototiller to control various broadleaf weeds that were beginning to dominate the planting.

Survival measurements began in willow clone site-trials across New York, Pennsylvania, and Vermont. Survival measurements will be completed by the end of November 1998. Foliage was collected for nutrient analyses in all clone-site trials that were planted during 1998 and in those that are scheduled for harvesting during winter 1998-1999. Mechanical weed control was completed in the willow clone site-trial planted in Sheridan, NY during 1998.

A formal effort is being made to standardize operating procedures in the monitoring demonstration plantings and clone-site trials. SUNY-ESF produced and implemented a Standard Operating Procedure (SOP) on foliage sampling. A second SOP was developed and is being tested for sampling survival in large-scale plantings. Other SOPs will be developed as needed, as part of a critical quality assurance program. A field map was prepared for all willow bioenergy trials established to date. A new laboratory sample tracking system was established to increase the efficiency of sample processing, an increasingly difficult task with the large increase in samples being analyzed.

2.3.2 *Production Systems*

Planting System Testing, Evaluation, and Optimization

A disc mower was tested as an alternative to sickle-bar mowers for first-year coppicing. Staff from SUNY-ESF and the Department of Agricultural and Biological Engineering at Cornell University attended the demonstration at Tully, NY. Rather than producing clean cuts, the mower shredded some stems and did not cut others. Individuals involved in willow biomass production in the United Kingdom were contacted to determine what machinery they use for first-year coppicing. They indicated that sickle bar mowers produce the best results. Staff from SUNY-ESF and the Department of Agricultural and Biological Engineering at Cornell University will modify and test existing sickle bar mower so that stems are lifted as the machine passes, which is expected to decrease the number of stems that are missed by the mower. This modified equipment will be used to coppice the scale-up acreage planted earlier this year.

Harvesting System Testing, Evaluation, and Optimization

There was no activity on this subtask during this reporting period.

Evaluation of Other Supply Dynamics

There was no activity on this subtask during this reporting period.

2.3.3 *Environmental Studies*

Cornell University provided an interim report on its study of avian biodiversity in short rotation intensive culture (SRIC) willow plots (refer to Appendix C). These preliminary results listed the bird species observed per plot and per willow age class and provided information on nests found; the study found 80 nests of 7 different species.

A field study was initiated during fall 1997 at the SUNY-ESF research station in Tully, New York, to gain information on willow root growth. During July 1998, 24 minirhizotrons were inserted into the soil in a four-year-old willow trial at Tully to study root production and turnover. The tubes were inserted into plots where composted chicken manure had been applied in 1996 and in control plots that were not fertilized. Root growth monitoring began this reporting period and will continue through the fall and over the 1999 growing season.

2.3.4 *Power Generation Optimization*

There was no activity on this subtask during this reporting period.

2.4 Task 4 - Enterprise Development

2.4.1 *Business Optimization and Analysis*

Consortium staff continued their work on development of a willow energy crop economic model. During this period, several new model components were added and they are undergoing review. The Consortium expects to test the model more completely in the first quarter of next year. A flow diagram of the model presented at BioEnergy '98 is provided in Appendix D.

2.4.2 Enterprise Development

Approximately 40 people attended the Willow Biomass Field Day at the SUNY-ESF research station in Tully, NY on September 2nd. Issues discussed included using willow for end products such as large and small-scale energy production, snow-fences, willow baskets and trellises, etc. There was a noticeable shift in the participant's range of interests at this year's event compared with last year. This year, more individuals were interested in becoming actively involved in the development of a willow biomass industry. People expressed interest in producing and supplying plant stock, growing willows for energy, becoming involved in custom planting and harvesting operations, and capturing the multiple environmental benefits associated with willow biomass crops.

The annual Biomass-Bioenergy Advisory Board meeting was held on September 3rd. Items addressed included a program update, presentation and discussion of an economic model that is being developed, review of work highlighting the rural development benefits from the establishment of willow biomass acreage across the region, and discussion of the community meeting planned for October 28th in western NY.

During this reporting period, staff from Niagara Mohawk and SUNY-ESF met with United States Assistant Secretary of Energy Dan Reicher and Congressman Sherwood Boehlert in Utica, NY. Mr. Reicher and Mr. Boehlert were updated on the progress of the Salix Consortium's Biomass Power for Rural Development project. Discussions were held on how the program could be supported to reach its goal of developing a commercially viable business centered on willow biomass crops over the next few years.

SoCNY RC&D held a planning meeting in July with ten Agriculture Service Center staff, SUNY-ESF, and FORECON in Jamestown. The meeting provided valuable input on location, choice of date, invitations, and length and time of sessions. SoCNY RC&D booked the Masonic Lodge in Fredonia for two Community Meeting sessions on October 28th to increase attendance by a variety of people with different schedules. It also began coordinating other partners' efforts. SoCNY RC&D also mailed 132 personal invitations to the community meeting to environmental groups, economic development leaders, agricultural groups, and elected officials. These invitations were individualized and printed on letterhead with the logos of SoCNY RC&D, NMPC, SUNY-ESF, and FORECON, and with the Salix logo. In addition, staff from SUNY-ESF agreed to do radio interviews with WJTN in Jamestown, which will be recorded and aired in October.

Articles about the Willow Biomass Project and the community meeting were published in the following:

- Chautauqua County SWCD Newsletter, which is inserted in Cornell Cooperative Extension's Agriculture News with a total circulation of 1,350.
- Cattaraugus County SWCD Newsletter with a circulation of 800.
- A full-length feature article on the Willow Biomass Project was published in the Post Journal Saturday magazine, Sept. 5th issue, with a circulation of 45,000.
- Several other articles and mentions appeared in publications in early October.

These activities generated additional contacts including other media and individuals interested in participating in the program.

SoCNY RC&D attended the Willow Biomass Display at Empire Farm Days and spoke with fair attendees about the Willow Biomass Project, handed out materials, collected names and addresses of interested people and distributed the community meeting flyer.

At the September Mid-Atlantic RC&D meeting, SUNY-ESF and RC&D staff made a presentation entitled "Willow Biomass Crops: Home Grown Energy". RC&D staff from northern NY and Maryland expressed interest in examining ways to capitalize on willow's environmental and economic development benefits in their regions. The Consortium staff took this opportunity to promote the project and distribute flyers for the upcoming community meeting.

Jud Isebrands from the USDA Forest Service in Rhinelander, WI, visited SUNY-ESF to tour the research station at Tully with a specific focus on the genetic selection trial that is duplicated at the research station in Rhinelander. Plans were discussed for a collaborative effort to screen a range of pre- and post-emergent herbicides for willow biomass crops.

Staff from the Montreal Botanical Gardens visited the Tully research station to learn more about SUNY-ESF's research efforts and to discuss future collaborative efforts. Research with two willow species has been ongoing at the Montreal Botanical Gardens for several years. Opportunities exist to build on the knowledge and experience from SUNY-ESF and the Montreal Botanical Gardens to advance the commercialization of willow biomass crops.

Gerald Tuskan from Oak Ridge National Laboratory (ORNL); Robert Fritz from Vassar College, Poughkeepsie, NY; Bernadette Roche from Loyola College in Maryland, Baltimore, MD; and SUNY-ESF staff met to discuss willow breeding plans and collaborative research opportunities. Vassar College has an active willow breeding program with the objective of learning how genes for resistance to *Melampsora* rust move through natural populations. Plant materials will be exchanged between SUNY-ESF and Vassar College, and a joint research project may be pursued if funding sources can be identified.

The following papers were submitted for the Bioenergy Conference in Wisconsin in October:

- Downing, M.; Demeter, C.; Braster, M.; Hansen, C.; Larson, G.; and Volk, T.
Agricultural Cooperatives and Marketing Bioenergy Crops: Case Studies of Emerging

- Co-operative Development for Agriculture and Energy.*
- Lindsey, C. and Volk, T. *Economic and Business Model of a Commercial Willow Enterprise.*
 - Tharakan, P.J.; Abrahamson, L.P.; Isebrands, J.G; and Robison, D.J. *First Year Growth and Development of Willow and Poplar Bioenergy Crops as Related to Foliar Characteristics.*
 - White, E.H.; Neuhauser, E.F.; Abrahamson, L.P.; Volk, T.A.; Benjamin, W.H.; Peterson, J.M.; Gray, E.; Demeter, C.; and Lindsey, C. *The Salix Consortium - A Partnership for Bioenergy Commercialization.*

A pamphlet describing the willow bioenergy production system was prepared for distribution to the general public. This pamphlet will be part of the Environmental Information Series of public service brochures produced and distributed by SUNY-ESF.

APPENDIX A

List of Potential Acreage Scale-up Sites

APPENDIX B

Schedule of Task Deliverables

APPENDIX C

Cornell University Laboratory of Ornithology Interim Report