MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK • EASTERN SHORE

Extension Research Note - RNS3

Resultsof Hybrid Poplar Clone Trial After Two Years at the ERCOTree Farm in Prince George's County, Maryland

Purpose

TheBaltimore/Washington, D.C. Metro area produces about 900,000 wet tons ofbiosolids per year from area treatment plants (1998 data). While much of thismaterial has been applied to agricultural fields in the past, new regulationsand the loss of agricultural land to development have required investigatingother beneficial uses of biosolids.

Applicationto native forests has been the dominant method of utilizing biosolids in thePacific Northwest cities of Seattle and Tacoma, Washington. Negativeperceptions and concerns about forest application of biosolids havesuccessfully been addressed after decades of experience. However, the higherpopulation pressures in the Northeast make application of biosolids to nativeforest questionable.

A promisingtechnique has been developed on one site in the Washington metro area useshybrid poplar trees planted on abandoned gravel spoils. It is called deep rowapplication. Deep row refers to the application of the biosolids in a series ofshallow, wide trenches that are immediately covered, which eliminates odorproblems. After the site is graded, it is planted with hybrid poplar trees thatgrow rapidly for approximately 6 years using the nutrients in the buriedtrenches as their nutrient base. The deep clay layer underlying the more than10,000 acres of gravel spoils in the southern Maryland area minimize leaching.Since 1983, no negative water quality impacts have occurred.

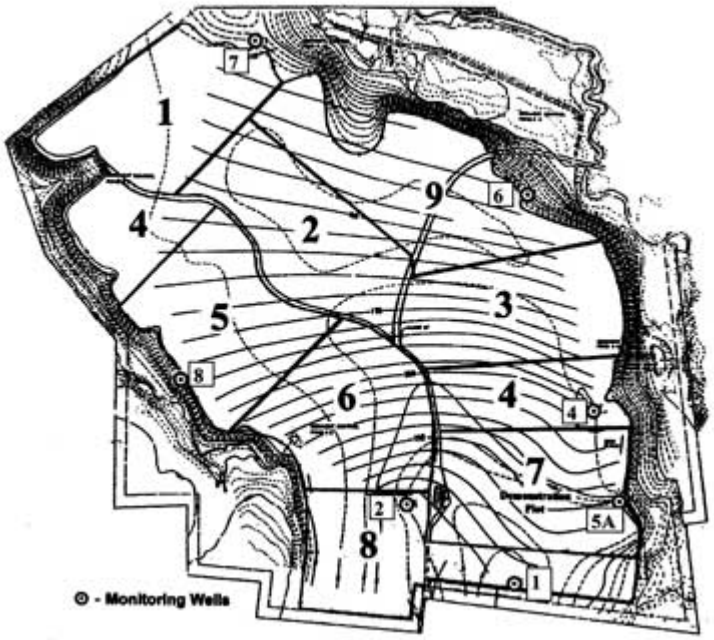
Deep-rowapplication of biosolids on reclamation sites is a unique alternative landapplication method that solves many of the problems associated with surfaceapplication techniques. When combined with the growth of nitrogen demandinghybrid poplar trees, it provides a natural recycling system that utilizesnutrients on-site, produces forest products, generates wildlife habitat, andreduces erosion while reclaiming abandoned, biologically dead soils created bysand and gravel surface mining operations.

The purpose ofthis study was to test a variety of hybrid poplar clones to see which performbest after two years of growth in this unique application. The lack ofnutrients in the existing soil onsite after mining combined with the biosolidsthat may contain as much as 20 percent lime to meet regulatory requirements,creates a unique mix of conditions. The clone used in the initial plantings wasHP308, but problems with cottonwood beetle, slow growth, and the changingmakeup of biosolids required experimentation with new clones.

Site Description

The ERCO siteis located in Prince George's county, MD, about 15 miles from Washington, D.C..It consists of a plateau with steep banks that fall away to a stream incision.All steep banks are covered with permanent forest cover. The edges of theplateau are bermed and runoff is routed to one of four detention ponds. Thestream on the east and north sides of the site are protected by an additionalthree detention ponds.

Atany one time, only one or two sections are cleared and replanted. Hence, only8-16% of the site is subject to significant surface runoff generation.Approximately 25% of the site (13 ha) is in permanent cover, either forestedsteep slope or detention ponds and buffers.
There areeight monitoring wells placed around the perimeter of the site that are used tosample groundwater at various depths. Since 1983, there have been no negativeimpacts on water quality



Site Map1- Plot layout of ERCO site showing nine4.05 ha sections planted with hybrid poplar, as well as seven monitoring wellsthat are numbered. Site is located onan abandoned gravel surface mine.

Experiment Description

DN 17	**OP 367**	**DN 5**		120'
DN 82	**HP 308**	**DN 70**	**184-411**	120'
50-197	**NM 6**	**DN 34**	**15-029**	120'
100'	100'	100'	100'	

Main Road

The design andsuggested layout of the clone trial was developed by Mike VanHam of SylvisEnvironmental in British Columbia, Canada, a private consultant who is retainedby ERCO, Inc.. The actual site location, data collection and analysis werecompleted by Eric Flamino of ERCO, Inc. and Jonathan Kays of MarylandCooperative Extension.

The entiretest area is 400 ft. by 360 ft. (see figure) and is located in Area 5 on thesite map. The test plots were divided into 12 equal sized blocks, which are 100feet by 120 feet. Each block wasplanted with a single hybrid poplar clone. Eleven clones were selected based on recommendations by SylvisEnvironmental, Inc. The source nursery and type of clone are provided in thetable below.

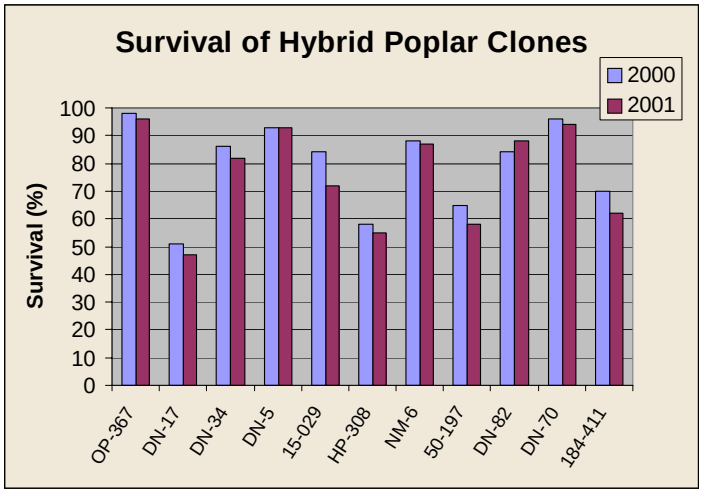
Source and Type of Hybrid Poplar Clones	
Source Nursery	Type of Clone
Itasca	NM6
Itasca	DN5
Itasca	DN17
Itasca	DN34
Itasca	DN70
Itasca	DN182
Itasca	OP367
Itasca	184-411
Itasca	15-29
Itasca	50-197
ERCO	HP308

The twelfth plot was planted withseedlings of Paulownia*tomentosa*butwere not included in the study. Individual trees were planted on a 10 ft. by 10ft. spacing. Each block contained 120trees. Only the thickest and best looking planting stock was planted. The planting stock consisted of a cut branchstem about one foot long and 1/2 inch in diameter. During the month of April,the cuttings were planted firmly into the ground with the top bud showing. Thevegetation competition between the rows was controlled by periodic mowing .

The survivaland total tree height was measured using a telescoping pole at the end of thefirst and second growing seasons. The data was entered and analyzed using SAS(Statistical Analysis System). Initial analysis of the data distributionindicated that using the square of the height measurements provided a betterdata distribution for analysis.

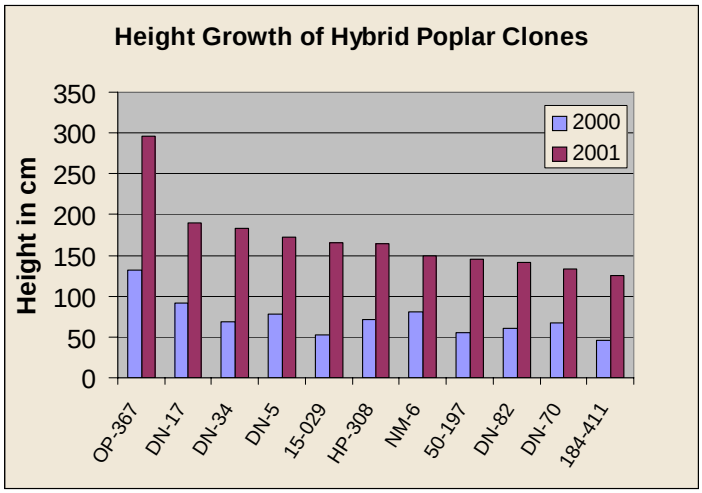
Results

Survival



Survival after the second growing season wasgreater than 90% for three clones with three other clones in the 80-90% range.These clones are: OP367 (96%); DN70 (94%); DN5 (93%); DN82 (88%); NM6 (87%);and DN34 (82%). The survival of clone 15-029 at 70% was lower than the others,but should receive some consideration due to its good performance in totalheight measures. The survival of other clones was under 80%, which wouldindicate they are not well adapted to survive in this environment.

Height



The OP367 was significantly taller thatall the other clones after the end of year 1 and year 2. The height growth inthe second year was 165 cm, 50 cm more than the next best performer DN34 at 115cm. The five tallest clones after five year were the following: OP367 (297 cm);DN17 (190 cm); DN34 (184 cm); DN5 (172 cm); and 15-029 (166 cm).

Conclusions

After twoyears, the OP367 clone is the superior performer of all the clones tested. Althoughit had the highest survival at 96%, there were two other clones (DN70&DN5) that had survival over 90%. The superior height growth of the OP367 iswhat set it apart as the superior clone. At 297 cm, it was 56% taller than thenext tallest clone, DN17. The poor survival of DN17 (47%) is a concern since itwas a superior performer in height growth. More analysis needs to be done todetermine if deer browsing may have impacted the survival.

Clone	Survival Rate (%)		Total Height (cm)		Height growth from yr. 1 - 2 (cm)
	2000	2001	2000	2001	
OP-367	98	96	131	297	165
DN-17	51	47	92	190	98
DN-34	86	82	69	184	115
DN-5	93	93	78	172	94
15-029	84	72	53	166	113
HP-308	58	55	72	165	93
NM-6	88	87	81	150	69
50-197	65	58	56	145	89
DN-82	84	88	60	141	81
DN-70	96	94	67	134	67
184-411	70	62	46	126	80

Field notesindicated that deer had caused serious mortality on some clones. When a stemwas damaged by deer browsing or rubbing it typically died back to the base. Inmany cases these stems died, impacting overall survival. For those stems thatdid grow, the lower heights could also impact the overall mean height of theentire treatment.

When survivaland height growth are considered together the DN34 and DN5 were the next twoclones behind the OP367 that should be considered for the ERCO site. However,if poor survival can be improved through irrigation or protection from deer,then the DN17 clone should be considered, due to its superior height growth.The clone trial will go for another year and the incremental height growth foryear three should provide confirmation of the performance of the clones in thistrial.

References

- Kays, J.S., E. J. Flamino, G. Felton,&P. D. Flamino. (2000). Use of deep-rowbiosolids applications to grow forest trees: a case study. In C.L. Henry, R.B.Harrison, and R.K. Bastian (Eds.),The Forest Alternative: Principles andPractice of Residuals Use. (pp. 105-110). Seattle, WA: University ofWashington College of Forest Resources
- MikeVanHam, Sylvis Environmental, Inc., personal communication.

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