

Tree Biomass Productivity Project

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Introduction

Fast-growing tree species, such as cottonwood (*Populus* spp.) and willow (*Salix* spp.), grow naturally throughout the Midwest, primarily along streams, and are excellent candidates for a new crop to grow on floodable sites. Other species, such as certain hybrid cottonwoods, are well suited to highly erodible lands (HELs). All of these species might be productive on normal agricultural soils. These types of trees can be used to establish plantings that can be harvested in 8 to 10 years and will re-sprout after harvest to produce another crop.

In 1995, we started establishing woody biomass productivity plots using fast-growing trees to develop yield information needed to do economic analyses of plantings on floodable lands, highly erodible lands, and normal agricultural soils.

The objectives of the project are: 1) to estimate the biomass production of hybrid poplar, silver maple, and willow on marginal agricultural (flood-prone and highly erodible) and non-marginal agricultural soils in Iowa, and 2) to evaluate the economics of plantations of hybrid poplar, silver maple, and willow on soils in Iowa.

Materials and Methods

On May 30, 1997, about 0.8 acres of land on the Northern Research Farm (near Kanawha) was used to establish a biomass productivity plot. The area was divided into eight parcels and planted with trees (Figure 1). Five species (clones) of trees were planted: Eugenii (a *Populus* clone), Crandon (a *Populus* clone), native cottonwood (a mixture of clones of Midwestern-Eastern cottonwoods supplied by Rick Hall), silver maple, and two willow clones

(referred to as pink and orange). Some of the plantings were of only one species and others were mixtures of two species (Figure 1). Rows were 10 ft apart, and trees were 6 ft apart within each row.

After planting, plots were marked, and a 5 ft wide band of pre-emergent herbicide was sprayed along each row of trees. Pre-emergents were applied for the first three years. Areas between the rows were mowed as needed during the first three growing seasons. A deer fence was placed around the planting for the first three years.

The trees have been measured yearly through the 2000 growing season. Each year total height and diameter at breast height (4.5 ft above ground) were measured for four trees in the middle of each of the seven rows, except for the first year when diameter was not measured. The trees in the middle of the rows are measured to avoid influence from the trees in the neighboring plots.

Results and Discussion

The average height, diameter, and percentage survival of the trees in each plot by species are listed in Table 1. Growth and survival of the two willow clones were similar, so they were combined. Survival has been excellent with most species at 100%. Growth has been good. Crandon, which is one of the fastest growing species/clones that we work with, averaged 7.1 m tall after four growing seasons. One of our most productive sites had four-year-old Crandon populus with an average height of 9.7 m.

Results from this planting and other plantings will be used to estimate productivity. This yield information will be analyzed to determine profitability of growing fast-growing trees, which farmers will be able to use to evaluate alternative management practices.

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8
Willow (orange)	Silver maple and Crandon	Silver maple	Crandon	Native cottonwood and Silver maple	Eugenii	Native Cottonwood	Hackberry, Osage orange, and Mullberry
Willow (pink)							

Figure 1. Layout of biomass productivity planting at Northern Research Farm.

Table 1. Average diameter at breast height (4.5 ft from ground) and total height by year for species planted on Northern Research Farm.

Plot	Species	Diameter			Height			Survival (%)	
		1998	1999	2000	1997	1998	1999		2000
		(cm)			(m)				
1	Willow	.2	.5	.9	1.1	2.6	4.5	6.5	97
2	Crandon	.2	.3	.5	.8	1.5	2.8	4.3	100
2	Silver maple	.3	.5	1.0	.9	2.3	4.0	6.3	100
3	Silver maple	.2	.3	.5	.8	1.6	2.9	4.8	100
4	Crandon	.3	.5	1.1	1.0	2.5	4.7	7.1	100
5	Native cottonwood	.5	1.0	1.5	1.4	3.5	5.9	7.8	100
5	Silver maple	.2	.4	.6	.9	1.8	3.5	5.8	91
6	Eugenii	.4	.5	1.0	1.2	3.5	4.9	7.4	100
7	Native cottonwood	.4	.9	1.3	1.4	3.7	6.1	8.1	100
8	Hackberry	.	.	.	.4	1.4	1.9	1.6	100
8	Mulberry	.	.	.	.9	1.8	2.0	2.7	100
8	Osage orange	.	.	.	.8	1.5	2.3	2.0*	100

*Osage orange had substantial top die back.