

## **RE-ESTABLISHMENT OF HYBRID POPLAR FOLLOWING THE CLEARCUT OF A 10-YEAR-OLD POPLAR STAND. AKA: “Son of Fiber Farm”**

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A Short Rotation Woody Crop plantation was re-established on an 8.4-acre site at the Forest Biomass Innovation Center (FBIC) in Escanaba, MI in 2010. A single poplar variety (a hybrid of *Populus nigra* and *P. maximowiczii* known as NM6) was planted between the rows of dead stumps of a previous plantation (known as the “Fiber Farm”) that had occupied the site until its harvest in 2008. In order to test the impact of site preparation methods and mid-rotation weed control, half of the planting area was tilled prior to planting and half of these areas received an herbicide treatment in the 4<sup>th</sup> and 5<sup>th</sup> years. This new plantation became known as the “Son of Fiber Farm”.

The Fiber Farm that previously occupied this site was composed of five poplar varieties and one variety of European larch. It was designed to test the feasibility of producing fiber on short rotations. A full report of this trial is available on the FBIC web site<sup>1</sup>. This trial ended in the fall of 2008 with the complete removal of all standing trees.

Vegetation and stump sprouts were allowed to develop and then killed with a broad spectrum herbicide (glyphosate) at the end of the 2009 growing season. Half of the site was tilled in a systematic way to provide six adjacent pairs (or replicates) of tilled and untilled main plots. Each main plot occupied 0.56 acres. Half of each main plot was treated with glyphosate during the 4<sup>th</sup> and 5<sup>th</sup> growing seasons, creating two sub-plots in each main plot. Each sub-plot occupied 0.28 acres. The final design was therefore a split-plot randomized block design with six replications of two sub plots in each of two main plots.

Tilling was done in November of 2009 by passing a 5’-wide rototiller in the 8’-wide spaces between rows of the old stumps. Ten-inch-long hardwood cuttings of NM6 poplar were planted every 7’ along these tilled and untilled strips in April of 2010 using a Whitfield tree planter. This produced a plantation density of 778 trees per acre, which had been determined to be optimal for short rotation poplar plantations<sup>2</sup>. Broadcast applications of pendimethalin and imazaquin were immediately applied over the entire planted site to limit weed growth. Fluazifop was broadcast in July of the first year to reduce competing grass cover on the site. This same herbicide regime was followed in the second and third years.

Half of each main plot was sprayed with glyphosate during the fourth and fifth growing seasons in order to test the effectiveness of releasing older trees from the weed competition that had developed. Herbicide was applied with a shielded micro-droplet sprayer to avoid damage to the poplar trees. The strips sprayed with glyphosate remained weed-free from the time of treatment until the trees were measured in the spring of 2017.

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<sup>1</sup> FBIC Research report 2017(g): Short rotation fiber farming in Michigan’s Upper Peninsula.

<sup>2</sup> FBIC Research Report 2016(c): Planting density effects on biomass growth of hybrid poplar varieties in Michigan.

Tree diameters at breast height (DBH) were measured in the spring of 2017 (after the 7<sup>th</sup> growing season). Trees were selected for measurement systematically, from entire rows within each tillage/spray treatment combination. An average of 50 sample trees per sub-plot were measured (although the actual number varied from 35 to 55 based on initial planting density and mortality).

An analysis of variance in tree diameters identified significant growth differences among replications but found no significant growth differences between tillage treatments or between spraying treatments.

Table 1. Analysis of Variance in DBH of 7-year-old hybrid poplar under various treatments.					
<i>Source</i>	<i>S.S.</i>	<i>d.f.</i>	<i>M.S.</i>	<i>F</i>	<i>Sig</i>
Tilling	1.751	1	1.721	1.705	0.192
Spraying(Tilling)	5.191	2	2.596	2.571	0.077
Replication	74.813	5	14.963	14.820	0.000
error	1202.462	1191	1.010		

Tilled portions of the site did not produce bigger trees than untilled portions of site. This was surprising because other attempts to establish hybrid poplars at FBIC without extensive site preparation have met with dismal failure. Removing weed competition from 4-year-old poplar also did not improve growth. This too is surprising because of anecdotal reports from Dr. Robert Froese of Michigan Technological University that described significant growth improvements after a similar release treatment in one of his poplar plantations near Onaway, MI.

Growth in this Son of Fiber Farm plantation was less than experienced in other local test plantations. Mean annual biomass increment by age 7 was 1.5 dry tons/acre-year. Another plantation of NM6 established at FBIC at the same time as this one (less than ½-mile from this site on similar soil) had produced 2.5 dry tons/acre-year at age 7. The NM6 poplar in the original 1998 Fiber Farm had produced 3.6 dry tons/acre-year by age 7, but that yield might have been influenced by fertilizer applications. Tree growth varies considerably in time and space as a function of numerous interrelated factors. It is not clear why this particular plantation was growing so poorly or why neither better site preparation nor improved weed control improved growth. Although the results of the analysis of growth here are quite clear, the reasons for this outcome are far from obvious.

