

Hybrid Poplar Performance

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Abstract Reduced availability of timber supplies from Pacific Northwest public lands and declining harvest from private lands has encouraged several companies in the wood products industry to search for alternative timber supply sources. Hybrid poplar has generated much interest and is currently grown on tens of thousands of acres in the northwest. Initially, hybrid poplar was considered primarily as a source of pulp. Changing economics for pulp has heightened interest in evaluating the potential for production of other wood products. Most northwest commercial hybrid poplar production is concentrated in the long growing season environment of the Columbia Basin.

A study was established at the Klamath Experiment Station (KES) in 1996 to evaluate the performance of eight hybrid clones in a short-season environment. Severe winter mortality was experienced in all but one clone and the study was abandoned in 1997. A second study was established in two KES fields in June 1999 to further investigate performance of the OP-367 clone, which experienced the best survival in the winter of 1996-1997. Soil differences between and within sites affected tree performance. Average tree height at the most productive sites was about 4 ft in September 1999 and nearly 12 ft in

October 2000. On March 22, 2001, vandals destroyed all trees at one of the sites.

Introduction

Poplar is a generic term used to refer to trees in the genus *Populus*. Aspen, lombardy poplar, black cottonwood, and eastern cottonwood are all members of this genus. Several hybrid (products of cross-fertilizing plants of different species) clones have been developed and constitute most of the commercial acreage. In the Pacific Northwest, hybrid poplar trees have grown to 70 ft in height and 15 in in diameter in just 7 years in the long-season environment of the Columbia Basin.

The availability of timber supplies for pulp and wood products in the Klamath Basin has been severely curtailed by loss of access to timber on public lands. Several mills in the area have closed in the past decade and supply to remaining mills from private land is rapidly being depleted. Wood product companies in the area are interested in determining if hybrid poplar is an economic alternative for the short-season environment of the Klamath Basin.

Procedures

1996

Eight clones were planted at KES in June on a 7-ft spacing in 10-ft rows. Seven clones were derived from parent stock

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2000 Annual Report

involving crossing of *Populus trichocarpa* (black cottonwood) and *P. deltoides* (eastern cottonwood). The other clone, (OP-367) was derived from a cross between *P. nigra* (European black poplar) and *P. deltoides*. Irrigation was continued well into the fall and tree buds did not have adequate time to “harden off” before the onset of winter. Severe mortality occurred in all clones except OP-367. All OP-367 trees survived the winter and had achieved an average height of about 4 ft during the first year (Leavengood, *et al.* 1997). The experiment was abandoned in the spring of 1997.

1999

Hybrid poplar clone OP-367 was planted on two observational blocks at KES on June 15. The northern block is a Poe fine sandy loam soil with pH about 7.0. The southern block is a Fordney fine sandy loam soil with pH ranging from 7.5 to 8.5 in a west-to-east direction. Both fields were ripped to a depth of 18 in with shanks spaced 18 in apart. Fields were moldboard plowed and a broadcast application of 500 lb/acre of 16-16-16 fertilizer was incorporated to a depth of 6 in. Poplar cuttings (“sticks”) were planted at 7-ft spacing in 14-ft rows on June 15. Irrigation was provided with solid-set sprinklers arranged on a 40- by 40-ft spacing equipped to apply 0.123 in/hour. The total water applied for the 1999 season was approximately 24 in, including rainfall. Irrigation was stopped in early September to allow tree buds to harden off. Weed control was achieved by cultivating between rows with a tractor-drawn harrow and within rows with an ATV-drawn harrow.

2000

The total irrigation plus rainfall for the season was approximately 24 in, as in

1999. To prevent root pruning, mechanical cultivation was not used for weed control in 2000. As an alternative, winter wheat was planted on May 2 as a cover crop to suppress weed competition. The cover crop and weeds were periodically flail-mowed during the summer. Foliar analysis performed in August of 1999 indicated elevated nutrient concentrations in both observational blocks. Therefore, no additional fertilizer was applied in 2000. Foliar analysis performed in August of 2000 indicated all major elements were at or well above recommended levels. Calcium and a few minor elements tested low, but deficiency symptoms were not identified.

Results and Discussion

1999

All trees in the northern block appeared healthy throughout the growing season. Trees in the center and eastern portion of the southern block began to show stress within 4 weeks of planting while trees in the western portion appeared healthy throughout the season. Poor performance in affected areas of the southern block was likely related to the high soil pH and the affect of this on minor nutrients. Growth data were collected on September 8. Height varied significantly in the southern block. Average height was 58, 32, and 21 in for trees in the western, center, and eastern sections, respectively (Fig. 1). Height was somewhat varied in the northern block. Shading effects from nearby trees reduced growth in poplars nearest the trees. Average height for trees in the northern block was approximately 49 in. Weed control with the cover crop and mowing was adequate.

Research in the Klamath Basin

2000

Winter mortality of trees in the southern block was 100, 40, and 1.8 percent for eastern, center, and western portions, respectively. Mortality of trees in the northern block was 7.1 percent. High soil pH and related nutrient availability stressed trees in the eastern and center portions of the southern block and trees went dormant under less than optimum conditions, resulting in high mortality. It appears that an application of liquid sulfuric acid or similar compound needs to be applied through the irrigation system periodically through the growing season if trees are to survive in high soil pH conditions. The winter wheat cover crop required minimal mowing and effectively reduced weed competition. Ceasing irrigation in the first week of September allowed adequate time for buds to “harden off” and appears to have prevented further winter mortality.

Growth data were collected in October. Trees in the northern block averaged 143 in tall with 94 in of new growth during 2000 (Fig. 2). Trees in the healthy western portion of the southern block averaged 139 in tall with 81 in of new growth achieved during 2000. In the center portion, trees averaged 111 in tall, having gained 78 in during 2000. All trees in the eastern section of the southern block were dead.

Future Direction

All trees were pruned in February 2001 to remove multiple leaders and limbs below 1 ft. The stand was thinned by removing alternate trees, leaving stand of 14- by 14-ft or approximately 220 trees/acre. Future pruning will occur annually to promote knot-free trunk wood. Height and diameter data will be collected annually.

Vandals cut down all trees in the southern block on March 23, 2001. The action was part of a protest by a radical environmental group opposed to genetically modified organism (GMO) research. While some research is being conducted on genetically altered hybrid poplars, none of the trees at KES were genetically modified. Experimental plantings of hybrid poplars, including some GMO material, at other research sites in the Corvallis, Oregon area were also destroyed on the same date.

Summary

Providing that remaining trees are not vandalized, the observational study will be continued for several more years to determine performance of hybrid poplars under the limiting climatic conditions in the region. Preliminary observations indicated growth rates during the first 2 years were significantly less than rates observed in the long season areas of the Columbia Basin and the Treasure Valley in eastern Oregon.

References

- Leavengood, S., J. Dahm, and K.A. Rykbost. 1997. Hybrid poplar research. Pages 84-88 in *Crop Research in the Klamath Basin, 1996 Annual Report. Special Report 981, Agricultural Experiment Station, Oregon State University, Corvallis, OR.*

2000 Annual Report

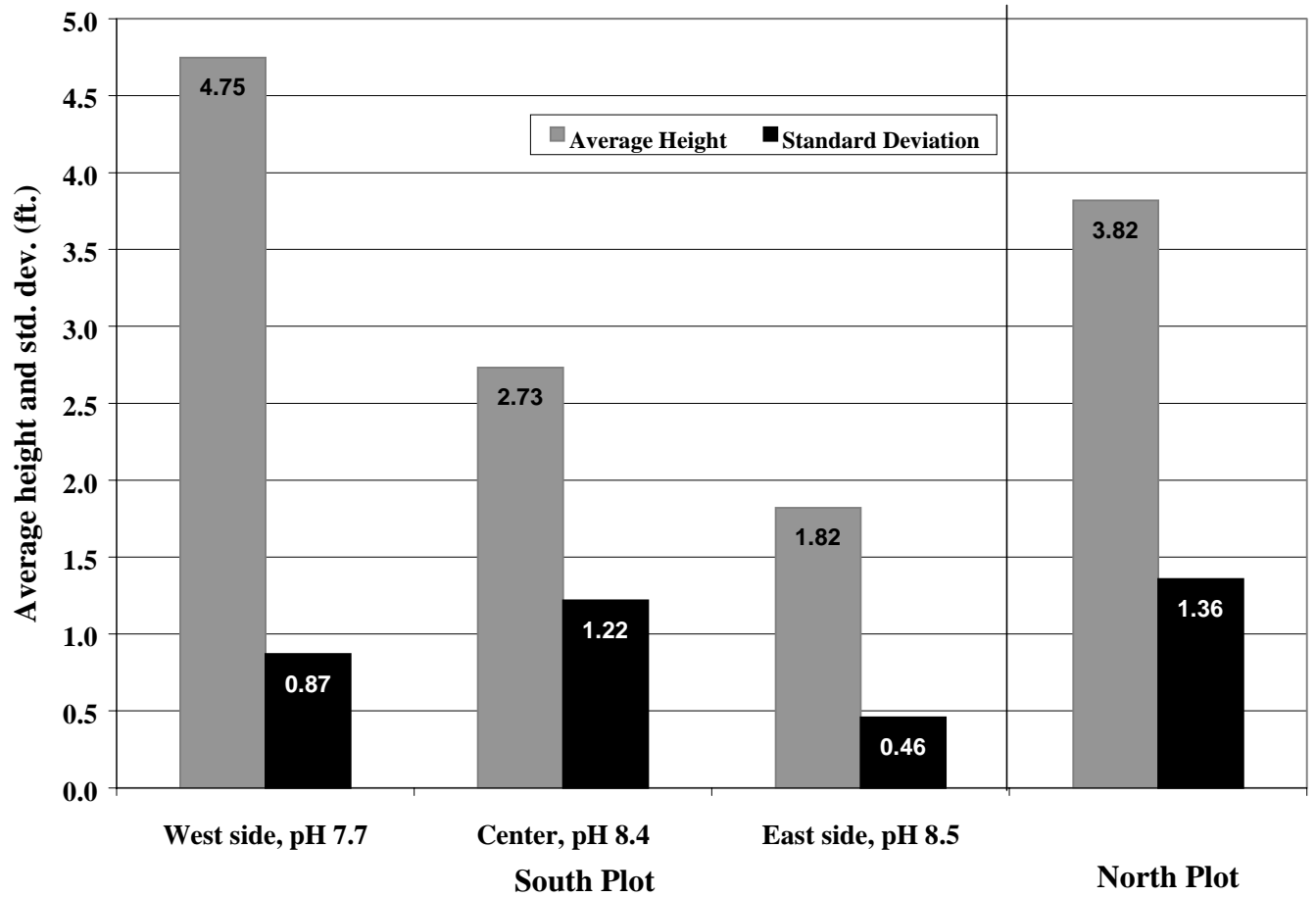


Figure 1. Average height and standard deviation in September 1999 for hybrid poplar clone OP-367 planted on June 15, 1999 at Klamath Falls, OR.

Research in the Klamath Basin

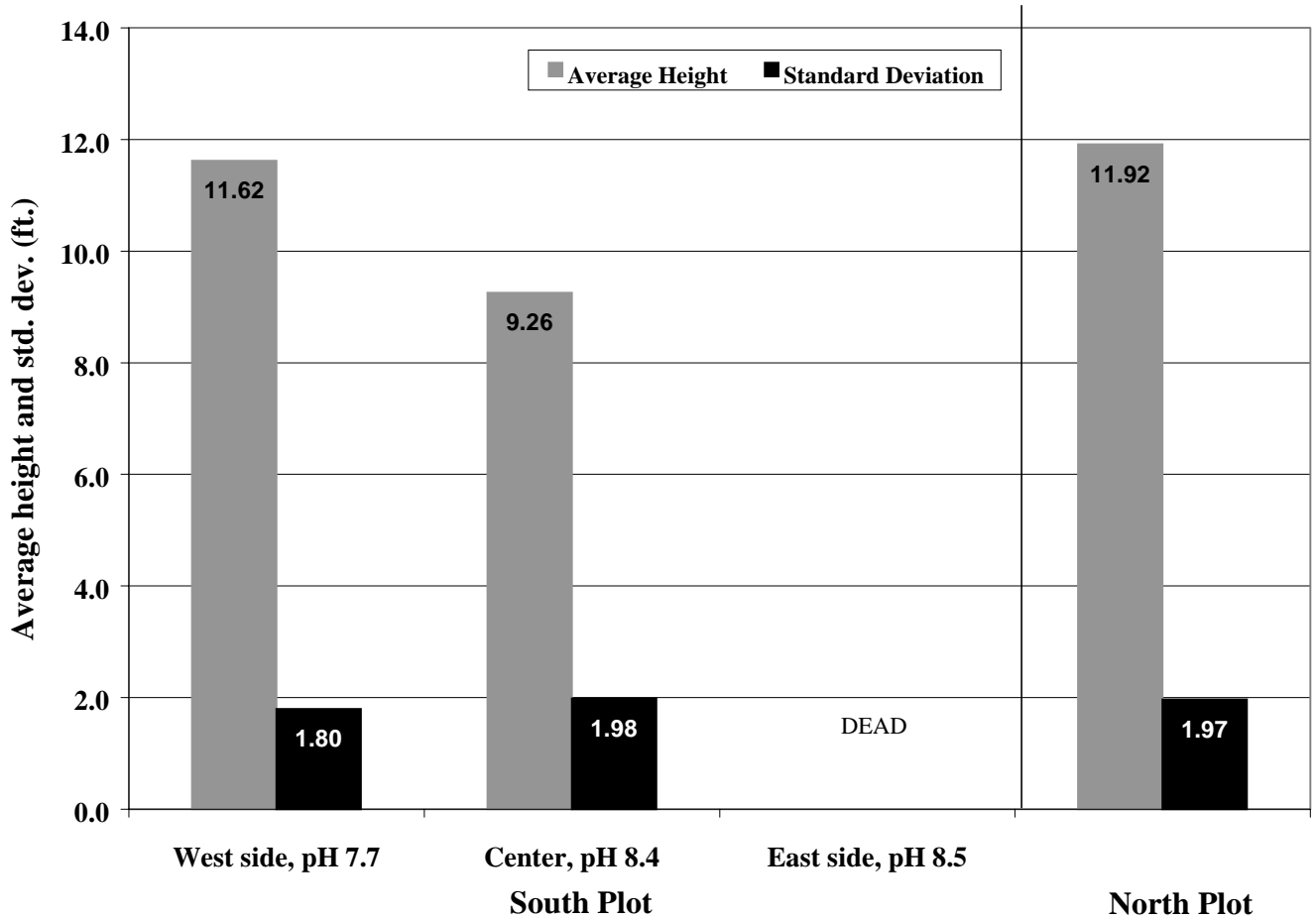


Figure 2. Average height and standard deviation in October 2000 for hybrid poplar clone OP-367 planted on June 15, 1999 at Klamath Falls, OR.