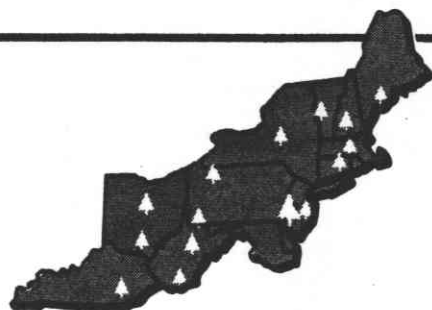


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HYBRID POPLAR PULPWOOD AND LUMBER FROM A RECLAIMED STRIP-MINE

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Abstract. A 2-acre hybrid poplar planting on a reclaimed strip-mine was harvested at age 16. The commercial clearcut yielded 90 tons of pulpwood and 9,400 board feet of lumber. This is equal to a growth rate of approximately 2 cords per acre per year. Selected physical properties of the hybrid poplars were compared with those of other commercial eastern species.

THE PLANTATION

In the spring of 1962, W. G. Jones, conservationist and contract planter, established hybrid poplars on a reclaimed strip-mine in Clearfield County, Pennsylvania, using greenwood cuttings supplied by the Ohio Reclamation Association. There is no record of the clones he used. The planting site was on the outslope of a spoil bank which had not been severely compacted by heavy equipment. Drainage was good and root penetration was not restricted. The spoil was moderately acid but not enough to restrict tree growth.

Because it was not known how well hybrid poplars would perform on Pennsylvania strip-mine spoils, a mixture of hybrid poplar, white spruce, and Scotch pine was planted. The planting pattern was one row of hybrid poplar adjacent to either one or two rows of conifers at 6- x 6-foot spacing. Initial survival of all species was excellent, averaging 80 percent or higher. However, the slow-growing conifers were quickly overtopped by the hybrid poplars and many died from suppression. The end

result was a hybrid poplar plantation with a conifer understory. During the first 6 years in the life of the plantation, the region was under the influence of drought; rainfall was approximately three-fourths of normal and growth of the hybrid poplars was probably reduced.

THE HARVEST

After 16 growing seasons the hybrid poplars were harvested (Davidson and Riddle 1978). They averaged 10 inches in diameter and 65 feet in height. Approximately 600 trees were harvested from the 2-acre plantation. Most of the wood was used for pulp; the logs were cut into 5-foot bolts to a top diameter of 5 inches. A few butt logs and second logs were sawn into lumber. Total yield from the harvest was 90 tons of pulpwood bolts and 9,400 board feet of lumber. Cord volume of the harvested pulpwood was not determined, but on the basis of preharvest samples, it is estimated at about 33 cords per acre. This equals a growth rate of about 2 cords per acre per

Table 1.—Selected physical properties of hybrid poplar compared with those of other species.

Property	Hybrid poplar ^a	Bigtooth aspen ^b	Eastern white pine	Northern red oak
Specific gravity	—	0.39	0.35	0.63
Modulus of rupture (lb/in ²)	8,047 (718)	9,100	8,600	14,300
Modulus of elasticity million lb/in ²)	0.91 (.14)	1.43	1.24	1.82
Compression parallel to grain— maximum crushing strength (lb/in ²)	3,604 (377)	5,300	4,800	6,760
Compression perpendicular to grain—fiber stress at proportional limit (lb/in ²)	886 (115)	450	440	1,010

^aStandard deviation (in parentheses) of samples tested.

^bValues for other species from U.S. Department of Agriculture. 1974. Wood handbook: wood as an engineering material. U.S. Dep. Agric., Agric. Handb. 72. Values adjusted for wood with 12 percent moisture content.

year. Compared to a rate of 0.7 cords per acre per year for yellow-poplar on site index 100 (Beck and Della-Bianca 1970), the hybrid poplars have performed exceptionally well on this site.

Logs from two of the hybrid poplar trees were taken to the Pennsylvania State University for testing. The logs were sawn into small blocks, 1 x 1 x 12 inches, and the blocks were kiln dried for physical testing. Results of these tests indicate that some properties of the hybrid poplar wood are similar to other commercial eastern species.¹ As Table 1 shows, the hybrid poplar is nearly equal to eastern white pine in rupture strength and stronger than both white pine and bigtooth aspen in compression strength perpendicular to the grain. It has lower elastic strength than any of the three species to which it was compared and will crush more easily under pressure applied parallel to the grain.

DISCUSSION

The harvest of commercial-size pulp and sawlogs from a reclaimed strip-mine is good indication that previously mined lands can be returned to productive use. Hybrid poplars have shown potential for rapid growth on spoils, in spite of drought and harsh site factors. The slow growth of the conifers enabled the hybrid poplars to develop rapidly without competition or the need for thinning. A previous study showed that hybrid poplars planted at 6- x 6-foot spacing needed to be thinned at age 5 (Davidson and Davis 1972). It is doubt-

ful that the pines or spruces will now develop into usable trees because they were so badly suppressed.

In future plantings of hybrid poplar it would probably be better to use alternate rows of a shrub species rather than conifers. This type of planting would be of greater benefit to wildlife and should still eliminate the need for early thinning. Especially beneficial to the poplars would be a nitrogen-fixing shrub such as autumn olive.

The physical properties of hybrid poplar measured in this study indicate that the wood can be used for more valuable products such as construction lumber, interior woodwork, core stock for veneers, and others, as well as pulp.

Additional field testing of hybrid poplars has identified several clones that are adapted to planting on strip-mine spoils. Mixtures of selected clones for reclamation planting are available from the Pennsylvania State Forest Nurseries and should be used if hybrid poplars are a part of a reclamation plan.

LITERATURE CITED

- Beck, D. E. and Della-Bianca L.
1970. Yield of unthinned yellow-poplar. U.S. Dep. Agric. For. Serv. Res. Pap. SE-58, 20 p.
- Davidson, W. H. and Davis, G.
1972. Sprouting of thinned hybrid poplars on bituminous strip-mine spoils in Pennsylvania. U.S. Dep. Agric. For. Serv. Res. Note NE-147, 6 p.
- Davidson, W. H. and Riddle, J.
1978. Old strip mine produces . . . new pulp-wood crop. Pa. For. 68(2):18.
- Jones, W. G.
1971. On reclaimed spoil banks . . . timber! Coal Age 76(11): 58-61.

¹Personal communication from Dr. Wayne Murphy, School of Forest Resources, The Pennsylvania State University, September 27, 1977.