



**HYBRID POPLAR PLANTATIONS OUTGROW DEER
BROWSING EFFECTS**

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ABSTRACT.--Good plantation establishment techniques along with fast growing clones result in minimal deer damage to hybrid poplar plantations. Although deer prefer certain clones, as food becomes scarce they eventually browse all clones. With proper establishment, trees grow to or beyond the reach of browsing deer in the first year and well beyond in the second. Poorly established plantations result in slower growing trees that are likely to be browsed for several years and remain indefinitely in the shrub stage or even cause plantation failure.

KEY WORDS: Intensive culture, plantation establishment, deer damage, hybrid poplar.

Animal damage, particularly browsing by white-tailed deer (*Odocoileus virginianus*) is a major concern in establishing intensively cultured hybrid poplar plantations (Hansen *et al.* 1983). Native aspen leaves (mainly *Populus tremuloides*) are a principal summer food of deer in the Lake States (McCaffery *et al.* 1974, Stormer and Bauer 1980). Hybrid poplar plantations contain succulent trees providing excellent deer feed, often on open fields with few weeds similar to traditional farm crops. McKnight and Biesterfeldt (1968) reported that white-tailed deer are probably the most serious threat to commercial cottonwood plantations in the south during the first growing season. Deer have a preference for certain hybrid poplar clones (Verch 1979): penned deer consumed the leaves of two of five clones before feeding on the other three. However, over longer time (8-24 hours) the deer consumed the leaves of all five clones.

Height of trees browsed, amount browsed, season of browse, and effect of deer browse on subsequent

growth of newly planted hybrid poplars were evaluated in two studies on the North Central Forest Experiment Station's Harshaw Forestry Research Farm 17 kilometers west of Rhineland, WI. Natural forest lands surrounding the farm have a moderately high deer population, 0.1 per hectare (25-30 per square mile, McCaffery, Personal Communication¹), which provides ample opportunity for deer browsing. The first study evaluated clonal preference of deer in a natural setting; the second study evaluated the impact of browsing on tree height and subsequent growth.

**METHODS
Study 1**

Thirteen hybrid poplar clones (table 1) were planted in a randomized complete block design with three replications. The study area was adjacent to a natural woodlot. Each clone was planted in 49 tree plots at 1/2 x 1/2 meter spacing.

The study area was an abandoned farm field dominated by quackgrass (*Agropyron repens*). Site preparation began in October 1978 with a broadcast application of the herbicide Roundup (glyphosate) at the rate of 2.2 kg active ingredient per hectare (2 lbs/acre). Two weeks later the area was moldboard plowed to a 25 cm depth and disked with an offset disk. On May 14, 1979 the pre-emergent herbicide Treflan (trifluralin) was applied at 1.1 kg/ha (1 lb/acre) and disked in. Hardwood cuttings 20 cm long were hand planted to a 15 cm depth on May 21, 1979.

¹McCaffery, Keith, Wisconsin DNR, Wildlife Research, Boyce Dr., Rhineland, WI.

Table 1.--Deer browsing preference for 13 hybrid poplar clones during the first growing season as measured on September 25, 1979 (clones next to a common line are not significantly different)

Clone		Parentage	Percent browsed
Original number	North Central number		
NE-298	5332	<i>P. nigra</i> var. <i>betulifolia</i> × <i>P. trichocarpa</i>	85
NE-252	5334	<i>P. deltoides</i> var. <i>angulata</i> × <i>P. trichocarpa</i>	53
NE-1	5272	(<i>P. nigra</i> × <i>P. laurifolia</i>) 'Strathglass'	50
NE-386	5263	<i>P. candicans</i> × (<i>P.</i> × <i>berolinensis</i>)	48
--	5260	(<i>P. tristis</i> × <i>P. balsamifera</i>) 'Tristis #1'	38
--	5351	<i>Populus</i> spp.	27
--	5258	<i>Populus</i> spp.	23
DN-30	5323	<i>P.</i> × <i>Euramericana</i> 'Canada Blanc'	23
NE-299	5331	<i>P. nigra</i> var. (<i>betulifolia</i> × <i>P. trichocarpa</i>)	22
--	5377	<i>P. Euramericana</i> 'Wisconsin #5'	21
NE-372	5266	<i>P. deltoides</i> var. <i>angulata</i> × <i>P. trichocarpa</i>	19
DN-28	5325	<i>P.</i> × <i>Euramericana</i> 'Ostia'	18
NE-375	5264	<i>P. deltoides</i> var. <i>angulata</i> × <i>P. nigra</i> var. <i>plantierensis</i>	13

Tree survival, total height, and deer browse incidence were recorded at the end of the first growing season, September 25, 1979. They were recorded again on May 19, 1980 after a winter of exposure to heavy browsing. The length of stem browsed was determined by subtracting the spring height from fall height on the browsed trees.

Two way analysis of variance was run on amount of shoot removed by winter browsing, on incidence of fall browsing by clone, and spring incidence of browsing by clone for the 13 clones in Study 1. The LSD method was used to rank the clones by browsing preference (table 1).

Study 2

A 2.8-hectare old field site was prepared in the fall of 1979 using the same procedure at Study 1. Hardwood cuttings of hybrid poplar clone NC-9922 (a clone of unknown parentage but closely resembling clone NE-252 *P. deltoides* var. *angulata* × *P. trichocarpa*) 20 cm long were machine planted at a 1 × 1 meter spacing on May 15, 1980. Ten to 15 deer frequented the site from the time of planting, often bedding down in the plantation. A 200-tree subplot was selected in the center of the plantation to record total tree height and deer browse incidence on September 16, 1980, May 12, 1981, and September 22, 1981. The trees in the test plot were divided into height classes based on measurements taken at the end of the first growing season prior to deer browse.

RESULTS

Study 1

There was a highly significant ($P < 0.01$) clonal difference in the percent of trees browsed by September 25, 1979 (table 1). However, there was no apparent preference for any particular parentage. Also, there was no significant difference between clones in the length of shoot removed by browsing. Approximately 8-10 centimeters were browsed from the terminal of all clones tested. Deer clearly preferred certain clones in the fall (table 1); however, by spring there was no significant difference in browsing due to clone.

Study 2

Deer browsed 55 percent of the 200-tree plot by the end of the first winter. Trees of all heights were browsed but fewer of those that exceeded about 1.3 m. Only 24 percent of the trees greater than 1.6 m tall were browsed compared with 70 percent of those less than 1.3 m (fig. 1). In the second year, browsed and unbrowsed trees had essentially the same growth (table 2). Total tree height at the end of the second growing season was 290 cm for the browsed trees and 303 cm for the unbrowsed trees. The average amount browsed by deer was 10 cm, which accounts for most of the 13 cm difference. The impact of browsing on subsequent tree height growth showed no relation to the initial tree height.

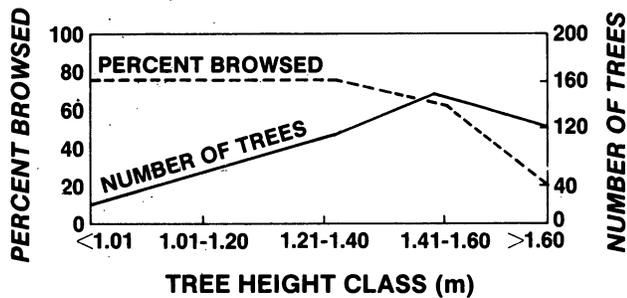


Figure 1.--Percent of hybrid poplars browsed, by height class. Height class is based on the tree height at the end of the first growing season prior to any deer browsing.

DISCUSSION

When food is plentiful, browsing deer prefer certain clones as illustrated here and in studies with penned deer by Verch (1979). However, by the end of the winter all clones tested were browsed equally. It will probably be difficult to identify clones resistant to deer browsing. An alternative to selecting unpalatable hybrid poplar clones is to plant fast growing clones using the best means of plantation establishment. Well-established hybrid poplar plantations are likely to be browsed during the first year but should grow above the reach of feeding deer the second year. Poorly established plantations will grow slowly allowing deer to browse for more than one year, causing considerable impact on the plantation.

Table 2.--Second year height growth of browsed and unbrowsed hybrid poplars as related to height class at the beginning of the second season (Study 2)

Initial height class (cm)	Trees	Second year growth		Difference
		Browsed	Unbrowsed	
	Number		-----Cm-----	
100	15	137	123	+ 14
100-119	25	162	188	- 26
120-139	42	182	166	+ 16
140-159	64	192	192	- 0
160	54	196	218	- 22
Mean new growth		174	177	- 3

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