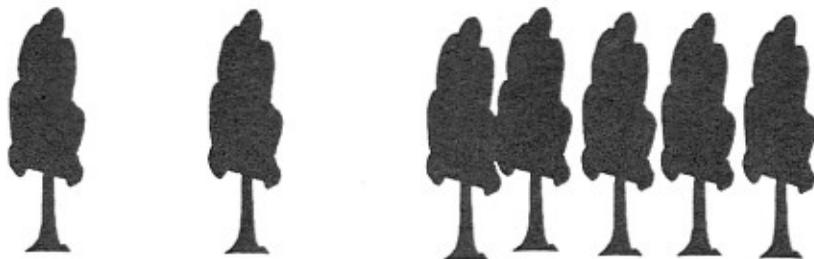
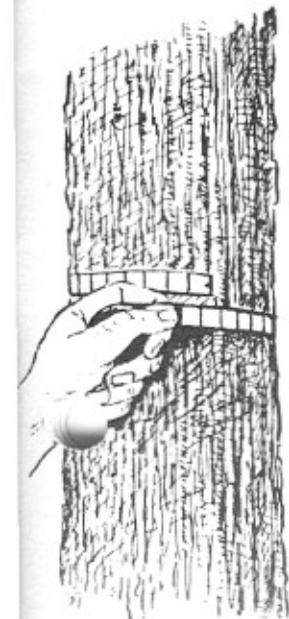


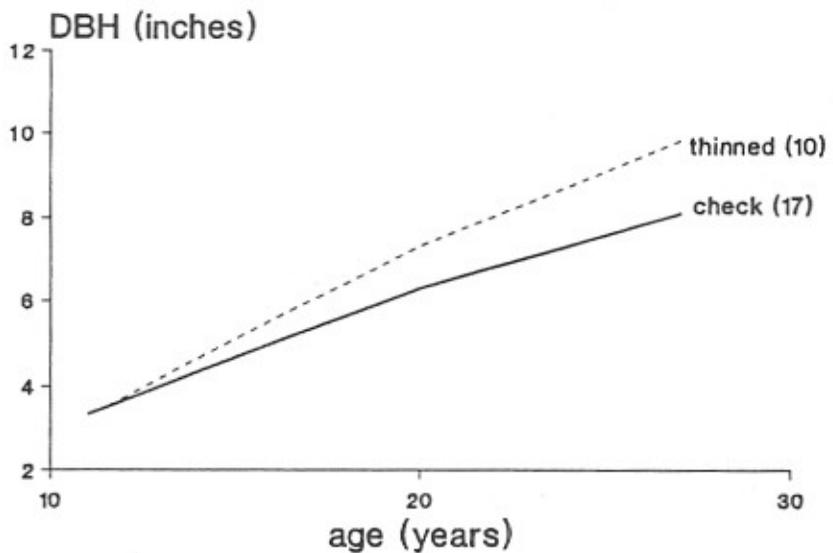
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The Paul Forest Hardwood Precommercial Thinning at Age 27



Northern red oak



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J. Walter Hodge, and John A. Scrivani



Virginia
Department of Forestry



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INTRODUCTION

A small, commercial clearcut of approximately eleven acres was made on the Paul State Forest in 1964, and a clean-up cutting for pulpwood was completed by the first of June in 1965. The Paul State Forest is located in Rockingham County, on the western edge of the Shenandoah Valley. The soils are derived from limestone, and site quality is good for growing hardwoods. The eleven-acre tract slopes gently to the west, and there is no evidence of serious soil erosion, although the area was probably cleared and farmed at one time.

The previous stand was understocked as a result of at least one, and probably several, partial harvests made before the land became the Paul State Forest. Scattered, large white oaks, about 150 years old, dominated the sawtimber portion of the stand (about 4000 board feet per acre), and red maple was the most important species in the pulpwood portion of the stand.

In May 1966, residual hardwoods left after the pulpwood clean-up were cut down, along with all advanced hardwood reproduction larger than 2 to 3 inches DBH. In places, there were considerable numbers of yellow-poplar saplings that originated following an earlier, partial harvest.

In September 1965, two transects were established, perpendicular to the slope. One transect was six chains long and contained 60 milacre plots and the other was five chains long and contained 50 milacre plots. Table 1 presents the number of hardwood seedlings and sprouts on a per acre basis, when the transects were installed one growing season following the pulpwood clean-up.

As happens on good hardwood sites following complete harvesting, a dense stand of hardwood "brush" and blackberry briars developed over the next few years, and walking through the area became difficult.



Installing the Precommercial Thinning Study

By age 11, starting from the pulpwood clean-up, the blackberry briars had mostly disappeared, and it was fairly easy to get around in the stand. Four swaths, each two chains wide, were laid out perpendicular to the slope (Figure 1). Two strips were left to serve as unthinned controls, and these were laid out so they would include the permanent transects installed at age 1. The other two strips were thinned. A series of one-tenth acre plots were established in each of the four strips, wherever the stand was suitable, giving us a total of nine check plots and seven thinned plots (Figure 1).

Crop trees were selected at an average spacing of about 15 feet, and we marked between 15 and 22 crop trees on each one-tenth acre plot. Crop trees were numbered and the DBH mark was painted. We measured and tallied DBH to the nearest .1 inch, total height to the nearest foot, and crown class for each crop tree. In addition to measuring crop trees, we also measured DBH to the nearest inch, by species, of all trees over 1.5 inches DBH on all plots, both check and thinned. At age 11, when the study was installed, trees less than 1.5 inches DBH were overtopped.

Thinning was accomplished by sawing down practically all dominants and codominants not selected as crop trees, plus most of the intermediates. There were only a few places where we had to leave rough or otherwise undesirable dominants or codominants as fillers, because we did not have a potential crop tree to leave. In selecting crop trees we favored northern red oak, white oak, black oak, and yellow-poplar. Where these species were not available, we left scarlet oak, hickory, and red maple. We also left a few sugar maple, bigtooth aspen, black locust, black cherry, cucumber tree, and hemlock.

Prior to the cutting, we again retallied the permanent transects, tallying just those milacre plots that fell within, or along the side of, the tenth acre check plots that we installed.

Plots were remeasured at age 20 and 27, making the same measurements that we did at age 11, including retallying the permanent transects.

RESULTS

Data for each crop tree (species, crown class, DBH, and height) on each of the plots at age 11, 20, and 27 is presented in the Appendix.

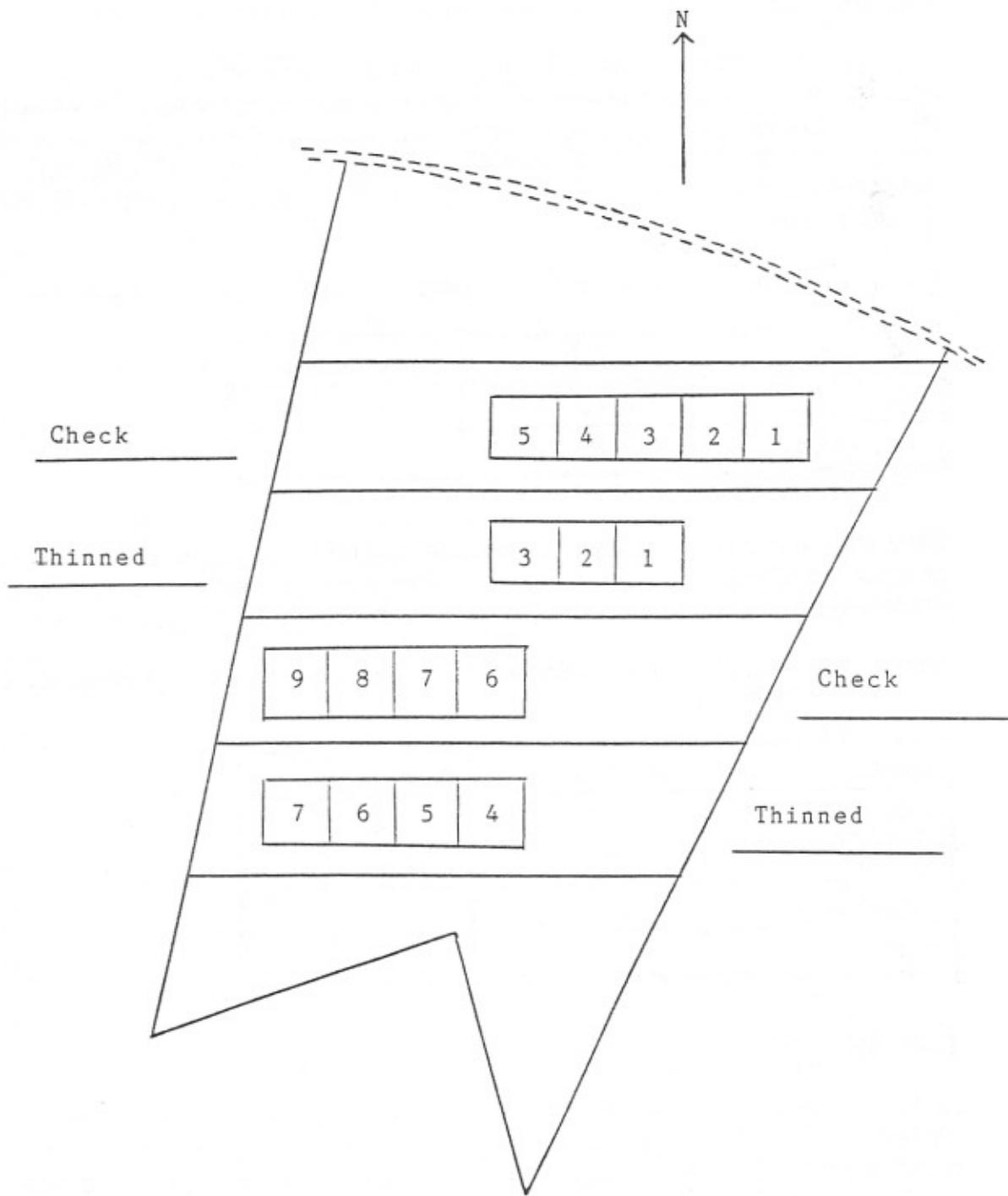


Figure 1. Layout of thinned and check swaths and location of measurement plots.

Regeneration

When the permanent transects were installed and tallied at age 1, one growing season after the clean-up cut for pulpwood, there were many small oaks and yellow-poplars in the regeneration (Table 1), and most of these were seedlings or very small sprouts. There were also many red maples, hickories, black cherries, and flowering dogwoods, but these were not tallied; only oaks and yellow-poplars, considered to be the most desirable species.

Table 1. Numbers of oaks and yellow-poplars per acre at age 1, on each of the transects.

Species	North Transect	South Transect
Oaks	6,600	7,520
Yellow-Poplar	2,690	280

Oaks were not tallied separately by species, but on each milacre plot it was noted whether a white oak, red oak (black oak, scarlet oak, or northern red oak in order of decreasing occurrence) or yellow-poplar was the tallest seedling or sprout (Table 2).

Table 2. Percent of milacre plots on which a white oak, red oak, or yellow-poplar was tallest at age 1.

Species	North Transect	South Transect
White Oak	16	18
Red Oak	53	70
Yellow-Poplar	29	10
TOTALS	98	98

Total Stocking

All trees larger than 1.5 inches DBH were tallied by species at ages 11, 20, and 27. White oak dominated the previous stand but will be a minor component of the present stand, even on the thinned plots, where white oak was favored as a crop tree whenever possible. Table 3 presents average stocking by species at age 11, prior to thinning. White oaks represented only 3% of the total number of trees present. No tally was made of total stocking immediately after thinning was completed. Tables 4 and 5 present average stocking by species at ages 20 and 27. At age 20 and 27, check plots averaged about 10 square feet per acre more basal area than thinned plots.

Table 3. Number of trees per acre >1.5 inches DBH, by species and DBH class, at age 11.

CHECK PLOTS								
DBH								
Species	2	3	4	5	6	7	8	Totals
White Oak	27	1	2	1				31
Red Oak ¹	224	63	16	2	3			308
Yellow-Poplar	123	58	28	9	5	3	1	227
Hickory	110	11	2					123
Red Maple	151	27	4					182
Black Locust	12	3	6	3				24
Black Cherry	40	12	2					54
Bigtooth Aspen	7	4	8	2				21
Dogwood	96	4	1					101
Sugar Maple	1							1
Blackgum	12	1						13
Sassafras	3							3
Shadbush	3							3
Hemlock	2		4	1				7
Cucumber		2	1					3
White Pine			1					1
Shortleaf Pine		1						1
TOTALS	811	187	75	18	8	3	1	1,103
Basal Area								38.6

¹Includes black oak, scarlet oak and northern red oak.

Table 3, cont'd.

Number of trees per acre >1.5 inches DBH, by species and DBH class, at age 11.

THINNED PLOTS							
DBH							
Species	2	3	4	5	6	7	Totals
White Oak	30	10	4				44
Red Oak	260	58	9				327
Yellow-Poplar	147	57	17	4		1	226
Hickory	87	8	4				99
Red Maple	163	68	6	3			240
Black Locust	17	10	10	6	3	3	49
Black Cherry	97	27	8	1			133
Bigtooth Aspen	2		1				3
Dogwood	147	1					148
Sugar Maple	16	1					17
Blackgum	4						4
Sassafras	6						6
Shadbush	8		1				9
Hemlock					1		1
Wild Plum	1						1
Witch Hazel	3						3
TOTALS	988	240	60	14	4	4	1,310
Basal Area							42.3

Table 4. Number of trees per acre > 1.5 inches DBH, by species and DBH class, at age 20.

CHECK PLOTS												
DBH												
Species	2	3	4	5	6	7	8	9	10	11	12	Total
White Oak	20	4	1		1	2						28
Black Oak	16	27	15	10	2		1					71
Scarlet Oak	22	18	34	16	9	4	2	1				106
No. Red Oak	2	4	7	6	11	6	2	2				40
Yellow-Poplar	63	32	46	29	33	19	12	3	7	2	1	247
Hickory	89	43	12	9	1							154
Red Maple	123	51	26	8	7	1						216
Dogwood	118	11	2									131
Black Cherry	12	16	6	3	2	1						40
Black Locust		1	2	5	2	1	1					12
Bigtooth Aspen		1	3	1	2	2	4	5	2			20
Blackgum	15	1										16
Sugar Maple	1		3	2								6
Shadbush	7	2										9
Hemlock	10	1	1		5							17
Cucumber				2	1							3
White Pine				1								1
Striped Maple	1											1
Totals	499	212	158	92	76	36	22	11	9	2	1	1,118
Basal Area												91.7

Table 4, cont'd. Number of trees per acre > 1.5 inches DBH, by species and DBH class, at age 20.

THINNED PLOTS
DBH

Species	2	3	4	5	6	7	8	9	10	11	12	Total
White Oak	12	3	6	3	3	1	1					29
Black Oak	30	16	17	22	14		4					103
Scarlet Oak	6	6	8	10	11	6	3					50
No. Red Oak		3	4	1	1	8	3			1		21
Yellow-Poplar	53	26	29	16	14	20	14	13	3	3	1	192
Hickory	39	19	4	1	3	1						67
Red Maple	83	32	13	9	12	4	1	1				155
Dogwood	211	29										240
Black Cherry	34	11	7	9								61
Black Locust		2					1	1				4
Bigtooth Aspen		2								1		3
Blackgum	1											1
Sugar Maple				4								4
Shadbush	12	1			1							14
Hemlock	1	2										3
Sassafras	5	1										6
Ash	1											1
Witch Hazel	4											4
Red Cedar	3											3
TOTALS	495	153	88	75	59	40	27	15	3	5	1	961
Basal Area												80.3

Table 5. Number of trees per acre > 1.5 inches DBH, by species and DBH class, at age 27.

CHECK PLOTS														
Species	2	3	4	5	6	7	8	9	10	11	12	13	14	Totals
White Oak		5	1			2	1							9
Black Oak		2	5	8	7	2	1	1	1					27
Scarlet Oak		3	5	8	11	4	5	4	2	1				43
No. Red Oak		2	1	6	3	6	6	4	2	2				32
Yellow-Poplar	37	23	22	20	26	23	18	19	13	6	2	6	3	218
Hickory	50	30	7	9	3	1								100
Red Maple	80	54	27	12	7	4	3							187
Dogwood	80	9												89
Black Cherry		5	5	3	1	1	1	1						17
Black Locust				1	1	2	1		1					6
Bigtooth Aspen				2	1	1	1		3	5	1	2	2	18
Blackgum	8	1												9
Sugar Maple			1	1		2								4
Shadbush	5	2												7
Hemlock	2	9	1		1					1				14
Cucumber				2			1							3
White Pine				1										1
Striped Maple	2													2
Hornbeam	1													1
Totals	265	145	75	73	61	48	38	29	22	15	3	8	5	787
Basal Area														117.3

Table 5, cont'd.

Number of trees per acre > 1.5 inches DBH, by species and DBH class, at age 27.

THINNED PLOTS

Species	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
White Oak	1		3	5		3	1		1						14
Black Oak	1	1	3	3	17	16	6	1	1						49
Scarlet Oak		4	1	4	3	8	3	4	3	1					31
No. Red Oak			1	2	3	2	3	7	2		1			1	22
Yellow-Poplar	34	14	13	16	9	13	11	19	10	19	7		1	3	169
Hickory	32	13	5	1	2	1	1								55
Red Maple	70	32	7	12	10	6	4	4		1					146
Dogwood	77	13													90
Black Cherry	9	6	7	4	4	4									34
Black Locust							2		1						3
Bigtooth Aspen	2												1		3
Sugar Maple					4		2								6
Hemlock	1	3													4
Shadbush		2				1									3
Witch Hazel	4														4
Ash		1													1
TOTALS	231	89	40	47	52	54	33	35	18	21	8		2	4	634
Basal Area															107.9

Height Growth of Crop Trees

Height growth of dominant and codominant trees does not seem to have been affected by thinning (Table 6). At age 11, and still at age 27, bigtooth aspen were tallest followed by yellow-poplar. The three red oaks were similar but shorter than yellow-poplar. White oaks, hickories, and red maples were shortest and will have difficulty keeping up with the yellow-poplar and red oaks. Eventually the bigtooth aspen, a short-lived species, should drop out. Over the past 7 years, from age 20 to 27, aspens have grown less in height than yellow-poplar and the red oaks (Table 6).

Table 6. Average crop tree height (in feet) by species, at ages 11, 20, and 27, based only on trees considered dominant or co-dominant at all 3 measurements (number of trees in parentheses).

Species	Age	Check	Thinned
Aspen	11	37.0	34
	20	64.4	67
	27	77.0 (8)	77 (1)
Yellow-Poplar	11	34.9	31.0
	20	55.0	51.8
	27	68.3 (27)	66.4 (33)
Northern Red Oak	11	29.1	29.0
	20	48.9	50.4
	27	63.4 (10)	64.4 (8)
Scarlet Oak	11	27.1	26.6
	20	46.9	45.4
	27	62.4 (8)	61.8 (9)
Black Oak	11	30	27.9
	20	49	45.9
	27	63 (1)	61.3 (7)
White Oak	11		27.5
	20		43.5
	27	(0)	55.5 (2)
Red Maple	11	27.0	30.4
	20	48.5	45.4
	27	61.0 (2)	56.0 (5)
Hickory	11		24.5
	20		41.5
	27	(0)	52.0 (2)
		(56)	(67)

Diameter Growth

Table 7 presents average DBH growth of crop trees between age 11 and 27, by species, for thinned and check plots. Rankings were similar for thinned and check plots; bigtooth aspen, yellow-poplar, northern red oak, and scarlet oak ranked 1, 2, 3, and 4, respectively, on both thinned and check plots. Black oak ranked 6 on thinned plots and 5 on check plots, and red maple ranked 5 on thinned plots and 6 on check plots. White oak ranked 7 and 8 and hickory 9 and 10 on thinned and check plots, respectively. Figure 2 shows average DBH of crop trees, at age 11, 20, and 27, for the eight most important species. Only crop trees that were alive at age 27 were included.

Thinning increased DBH growth of all species, as shown in Table 7. Figure 3 compares DBH of crop trees at age 11, 20, and 27, for thinned and check plots, by species. These graphs show that the response to thinning, for all species, was greater for the first 9 years than the past 7 years. However, the response has still been considerable for the past 7 years for yellow-poplar, northern red oak, and red maple (sample size is too small to put any importance on aspen and sugar maple). Response to thinning had run out by 9 years for scarlet oak, black oak, white oak, and hickory.

Table 7. Average 16-year DBH growth of all crop trees that survived to age 27, by species.

Species	THINNED PLOTS			CHECK PLOTS*			Difference
	No.	Growth	Rank	No.	Growth	Rank	
Yellow-Poplar	43	7.23	2	44	5.72	2	1.51
Scarlet Oak	19	5.14	4	23	4.04	4	1.10
Black Oak	23	4.51	6	9	3.64	5	.87
No. Red Oak	10	6.52	3	17	4.76	3	1.76
White Oak	9	3.33	8	4	2.50	7	.83
Red Maple	9	4.77	5	7	2.92	6	1.85
Hickory	5	2.86	10	9	2.01	9	.85
Bigtooth Aspen	1	10.80	1	8	7.90	1	2.90
Sugar Maple	3	4.23	7	1	1.30	10	2.93
Black Locust	2	3.10	9	1	2.40	8	.70

*Not included under check plots were three black cherry and one cucumber.

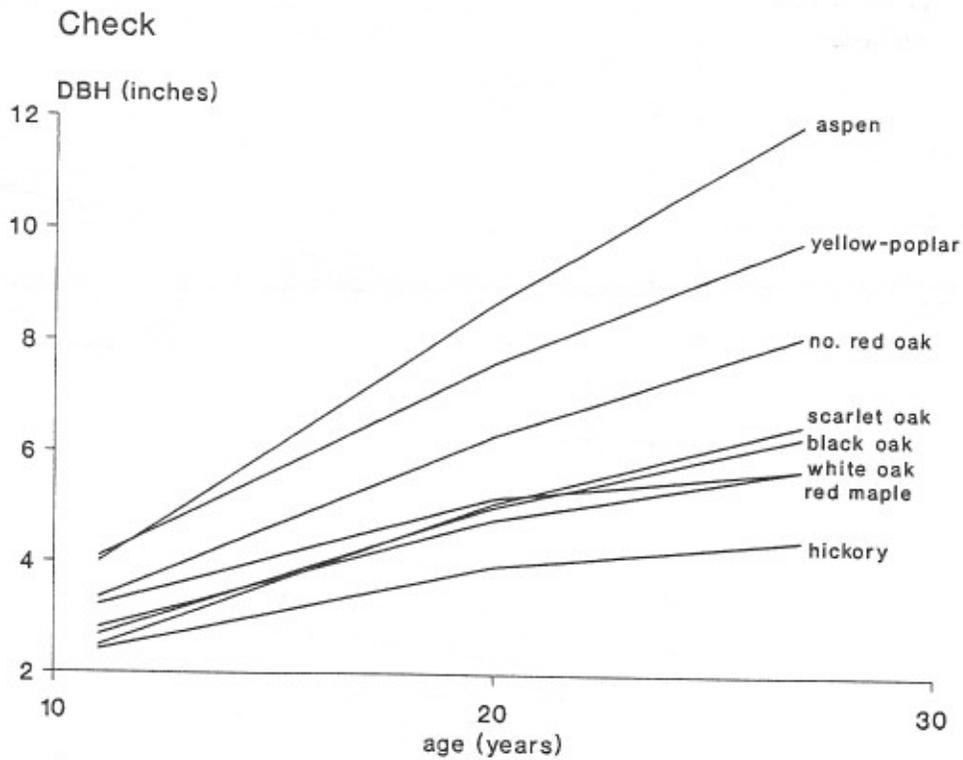
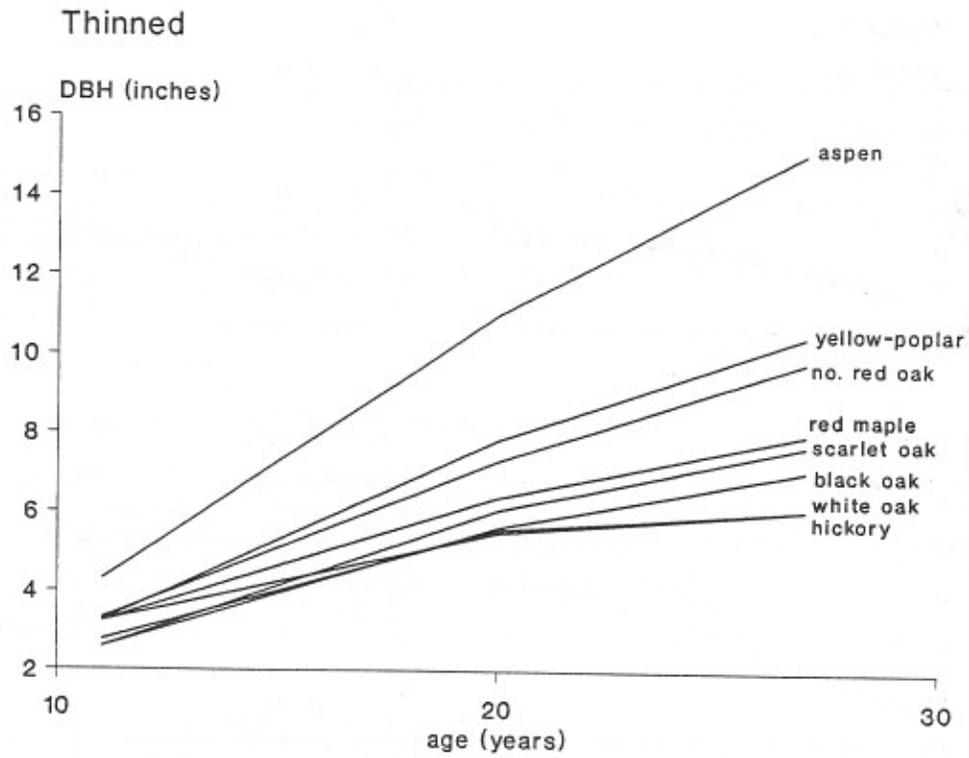


Figure 2. Average DBH of crop trees at age 11, 20, and 27 for the eight most important species.

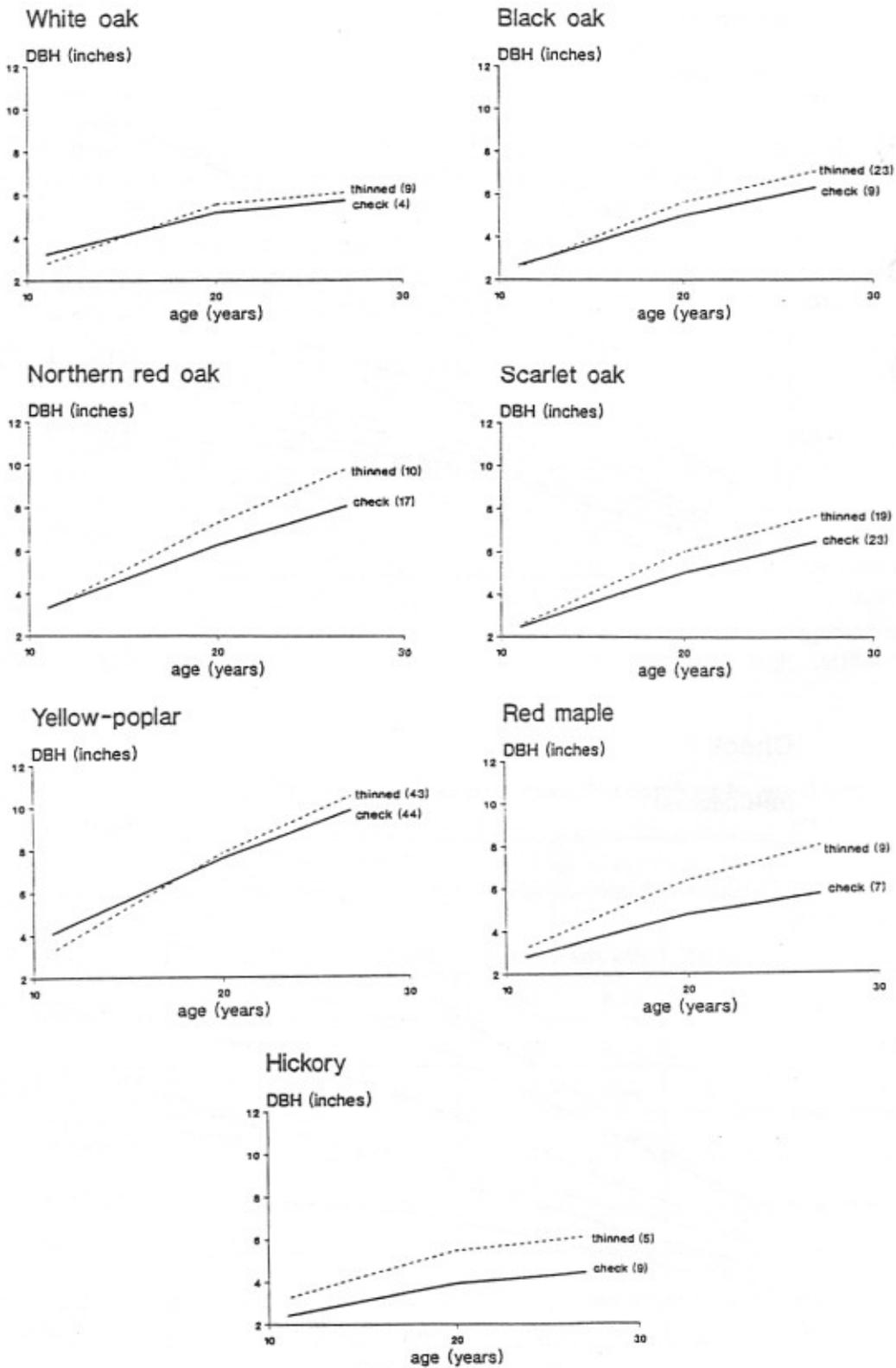


Figure 3. Average DBH of crop trees, by species, for thinned and check plots at age 11, 20, and 27.

An average of 18 crop trees were selected on each plot which is at least three times as many as should be present in a well-managed mixed hardwood stand at maturity. If we consider just the 5 largest (in DBH) crop trees per plot, there is a 1.0 inch difference in DBH at age 27 between thinned and check plots (Table 8). This is consistent with the average 16-year DBH growth of those same trees (Table 8). As one would expect, these 5 largest trees per plot are mostly the fastest growing species (Table 9).

Table 8. Average DBH and 16-year growth of 5 largest crop trees per plot, age 27.

THINNED PLOTS			CHECK PLOTS		
Plot	DBH	16-Year Growth	Plot	DBH	16-Year Growth
Thinned # 1	10.5	7.50	Check# 1	12.3	6.12
2	10.3	6.50	2	10.2	5.38
3	11.7	8.68	3	10.0	6.06
4	12.2	7.80	4	9.2	6.08
5	12.6	8.10	5	8.9	6.62
6	10.4	7.80	6	10.4	7.92
7	10.5	7.04	7	11.0	6.92
			8	10.3	6.88
			9	9.5	7.94
MEANS	11.2	7.63		10.2	6.66

Table 9. Number of trees, by species among the five largest crop trees per plot.

NUMBER OF TREES		
Species	Thinned	Check
Yellow Poplar	25	27
Bigtooth Aspen	1	8
No. Red Oak	3	5
Scarlet Oak	1	3
Black Oak	3	1
Red Maple	1	-
Black Cherry	-	1
Black Locust	1	-
TOTALS	35	45

Crown Class

In thinning, we tried to favor oaks as crop trees. We left dominant or codominant trees as crop trees wherever possible, but also left considerable numbers of intermediate oaks. We hoped that the release provided by the thinning would enable many of these intermediates to improve to codominant trees. We also left intermediate yellow-poplar, hickory, red maple, and sugar maple. We were not very successful in promoting intermediates to codominants (Table 10). For all species, only 13 of 44 released intermediates were codominant at age 27. Released intermediates did not fare much better than unreleased intermediates on the check plots. On the check plots, 10 of 54 intermediate crop trees became codominant by age 27. It is worth noting that no white oak or hickory intermediates improved to codominants.

Table 10. Numbers of intermediate crop trees at age 11 and number (and percent) that were codominants at age 27.

Species	THINNED PLOTS			CHECK PLOTS		
	Number at age 11	Age 27		Number at age 11	Age 27	
		No. CD	Percent		No. CD	Percent
Yellow-poplar	8	4	50	9	6	67
Scarlet Oak	12	1	8	13	1	8
Black Oak	13	5	38	8	1	12
No. Red Oak	2	2	100	6	2	33
White Oak	4	0	0	8	0	0
Hickory	2	0	0	8	0	0
Red Maple	1	0	0	1	0	0
Sugar Maple	3	1	33	1	0	0
TOTALS	45	13	29	54	10	19

It is also interesting to look at the numbers of dominant and codominant crop trees at each measurement (Table 11). On the thinned plots, there was a slight increase in codominant crop trees between age 11 and 20 resulting from released intermediates moving up, but between age 20 and 27, there has been a slight decline. On the check plots, there has been a steady attrition, and at age 27 there are only two-thirds as many dominants and codominants as at age 11. There are big differences among species on the check plots. Aspen, yellow-poplar, and northern red oak dominants and codominants have practically all remained dominant or codominant, and the attrition has been in the other species.

Table 11. Numbers of dominant and codominant crop trees per acre by species, at age 11, 20, and 27.

Species	THINNED PLOTS			CHECK PLOTS		
	11	20	27	11	20	27
Yellow-poplar	53	57	53	41	40	37
Black Oak	17	20	19	11	4	2
Scarlet Oak	17	20	14	22	9	10
No. Red Oak	11	11	14	14	14	13
White Oak	7	4	3	2	1	0
Hickory	4	3	3	3	2	0
Red Maple	11	10	7	7	2	2
Sugar Maple	0	3	1	0	0	0
Bigtooth Aspen	1	1	1	9	9	9
Black Locust	3	3	3	1	1	0
Black Cherry				3	3	3
Cucumber				1	0	0
TOTALS	124	132	118	114	85	76

Understory Changes

It has been interesting to observe the changes in "low vegetation" over the past 27 years. For the first few years, there was a "jungle" of low vegetation, with intense competition among commercially valuable tree species struggling to get into the canopy, understory tree species, shrub species, and herbaceous species. Blackberry briars in particular made it difficult to walk through the area.

Now, at age 27, the stand has opened up and has clearly stratified into an overstory and a subcanopy. The overstory has already been described, and the subcanopy is dominated by small red maple and dogwood. These are shade tolerant species that make it difficult for advance oak regeneration to develop. In recent years, small oak seedlings (mostly white oak) have appeared. On the permanent transects, at age 27, we counted 39 small white oaks (459 per acre). Only one of these was over 2 feet tall (barely) and most were only a few inches tall. We pulled up some of the largest and counted growth rings at the root collar, and the largest had about 15 rings. Similar small white oaks, numbering in the thousands per acre, can be found in an adjacent, old, white oak stand similar to the one harvested to create this study. These small seedlings seem to live a few years, die out, and be replaced by other seedlings, and none are able to grow large enough to have a chance to become dominant following a clearcut harvest.

On the forest floor, there is now a nearly continuous cover of herbaceous vegetation, dominated by perfoliate bellwort. The following species are also common: sessile bellwort, Solomon's seal, false Solomon's seal, puttyroot, hooked buttercup, black cohosh, jack-in-the-pulpit, violets, New York fern, and boulder fern.

It is interesting to speculate on the origin of this herbaceous vegetation. Adjacent to the study area is a 2-year-old clearcut of a similar, old, hardwood stand dominated by scattered, large, white oaks. It is now in the "brush-and-briar" stage. Perfoliate bellwort is very common down under the brush and briars. A total of 48 herbaceous species, including most of the species found in the 27-year-old stand, were found along a four chain permanent transect installed across the clearcut in July of the second season.

As already mentioned, there is an old, white oak stand adjacent to the study area on the side opposite the recent clearcut. It has the typical subcanopy of shade tolerant red maple (mostly), dogwood, and other species as is developing on the study area. On the forest floor, we observed the same species that we found on the precommercial thinning study area, with the exception of puttyroot. It seems as if many of the wild flower species present in the mature forest survive clearcutting to reestablish a ground cover as the new forest opens up and stratifies.

CONCLUSIONS

The precommercial thinning, which required considerable time and expense, has not made much difference in the developing stand. Species composition at rotation age will probably be similar on thinned and check plots, because the composition of the 50 largest trees per acre at age 27 is almost identical (Table 9). Another thinning to favor oak might increase the final oak composition, but this would be true for the check plots as well as the thinned plots. Ideally, a commercial thinning would be made at about age 40.

The 1-inch difference in DBH growth for the 50 largest trees per acre, as a result of thinning, will not reduce rotation age significantly. Assuming these 50 trees will still be growing at an average rate of about 2 inches in 10 years at rotation age, the reduction would only be about 5 years.

One of the primary benefits from thinning is that straighter, better formed trees of the more desirable species are favored, and we did this when we thinned these plots. Now, at age 27, however, it is hard to see much of a difference. The thinned plots will develop into a very desirable sawtimber stand, but so will the check plots.

Appendix

Individual Crop Tree Data for Each Plot:

Species, Crown Class, DBH (in inches), and Total Height (in feet) at ages 11, 20 and 27

Check Plot #1

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	D	7.9	48	D	11.5	64	CD	13.3	65#
2	YP	CD	3.7	31	CD	7.1	53	D	9.8	67
3	YP	CD	3.9	35	I#	6.3	52	I	7.5	64
4	YP	D	7.0	48	D	10.5	66	D	12.9	75
5	BO	I	3.1	29	DEAD			DEAD		
6	YP	CD	5.4	41	S#	7.2	47	S	7.4	62
7	YP	CD	6.4	44	D	10.4	60	D	12.5	72
8	H	I	3.1	29	S	4.0	~	DEAD		
9	SO	I	2.4	24	I	3.8	47	DEAD		
10	YP	D	4.5	34	D	9.0	60	D	11.9	69
11	BO	I	2.6	28	S	3.9	44	DEAD		
12	YP	CD	5.3	40	CD	9.2	57	CD	11.1	71
13	SO	CD	2.7	26	CD	6.2	50	CD	8.4	64
14	NRO	I	3.8	33	CD	6.4	55	CD	8.2	67
15	BO	I	3.2	34	I	4.8	48	DEAD		

Legend:

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Breakage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #2

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	D	5.0	41	D	8.1	56	CD	10.0	70
2	YP	D	7.3	44	D	11.1	60	D	13.6	70
3	RM	I	1.5	22	S	2.7	~	S	3.2	35
4	RM	CD	3.7	35	I	5.7	54	I	6.8	58
5	YP	CD	4.9	38	I#	6.7	49	I	7.0	65
6	H	I	1.9	22	S	3.2	34	S	3.3	38
7	NRO	CD	5.2	37	D	8.7	55	D	11.2	70
8	YP	CD	4.0	36	S#	5.0	44	S	5.1	45
9	NRO	I	2.2	27	I	4.5	50	DEAD		
10	YP	CD	4.0	39	D	7.9	59	S#	9.2	50
11	SO	CD	3.5	33	I	5.5	47	I	6.3	63
12	SM	I	2.4	27	S	3.5	41	S	3.7	41
13	H	I	3.0	26	I	4.6	42	S	5.0	51
14	SO	I	1.8	26	S	2.6	36	DEAD		
15	YP	I	2.7	27	CD	5.4	44	CD	7.1	58
16	YP	I	2.6	29	DEAD			DEAD		
17	RM	CD	4.1	34	I	6.1	48	I	7.0	62
18	SO	I	1.6	22	I	2.9	38	I	3.9	53

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:
 D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Breakage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #3

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	H	CD	3.7	31	I	4.9	47	S	5.3	57
2	H	I	2.6	21	I	4.7	40	I	5.6	51
3	YP	CD	4.4	37	S^	7.3	55	S	8.4	62^
4	YP	CD	3.4	32	I^	6.3	54	I	8.9	68
5	SO	CD	3.0	26	CD	6.2	47	CD	8.6	63
6	H	CD	2.6	24	CD	4.6	41	I	5.5	54
7	SO	I	1.8	22	I	3.6	40	I	4.5	53
8	WO	CD	4.7	28	I	7.2	43	S	7.9	51
9	SO	CD	2.5	26	I	4.5	38	I	5.9	57
10	YP	CD	6.7	42	CD	10.3	64	D	13.3	76
11	H	CD	2.2	23	CD	4.3	41	I	5.5	56
12	SO	CD	2.8	28	CD	6.1	45	CD	8.0	62
13	SO	CD	2.8	28	D	6.4	48	D	9.4	65
14	SO	CD	3.8	30	CD	8.0	45	D	9.8	63
15	YP	CD	4.8	33	I	7.1	49	I	8.5	60
16	NRO	CD	3.2	29	CD	5.7	46	CD	7.5	59

Legend:

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Breakage
 - = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #4

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	BO	CD	3.6	30	CD	7.5	49	D	10.4	63
2	H	I	1.9	21	S	2.5	31	S	2.5	30
3	NRO	CD	2.5	26	CD	5.5	46	CD	7.4	60
4	WO	I	1.9	22	DEAD			DEAD		
5	SO	I	2.3	23	I	4.9	46	CD	6.4	64
6	YP	CD	3.7	30	CD	6.6	49	S#	7.5	33
7	WO	CD	4.0	31	CD	6.6	48	I	7.4	57
8	YP	I	2.6	26	CD	6.2	49	I	7.8	57
9	YP	I	2.4	26	I	4.7	46	I	6.2	63
10	YP	I	2.9	27	CD	6.2	51	CD	9.5	67
11	NRO	I	2.4	23	CD	5.7	46	CD	7.5	63
12	WO	I	2.1	18	I	3.1	32	S	3.4	39
13	NRO	CD	3.5	28	CD	7.1	48	CD	9.1	62
14	BO	I	2.6	27	CD	4.4	46	CD	5.5	60
15	BO	I	1.6	23	CD	2.3	36	DEAD		
16	NRO	CD	2.8	30	CD	6.4	46	CD	9.0	63
17	NRO	I	2.8	26	I	5.1	43	I	5.9	54
18	BO	I	1.9	22	S	4.2	42	I	5.1	56
19	WO	I	1.8	20	DEAD			DEAD		

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed by Aspen

Check Plot #5

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	A	D	3.9	38	D	7.7	60	D	11.4	76
2	NRO	D	5.5	39	S#	7.5	~	DEAD		
3	SO	I	2.1	21	S	3.0	35	DEAD		
4	SO	CD	3.3	26	CD	6.8	49	CD	8.9	66
5	WO	I	2.1	18	S	3.8	36	S	4.2	38
6	BO	CD	2.9	27	I	4.6	47	I	5.5	63
7	A	CD	3.1	35	D	7.6	68	D	10.4	79
8	A	D	3.8	40	D	7.9	65	D	11.2	76
9	SO	I	2.0	21	S	2.8	32	DEAD		
10	WO	I	1.9	18	S	2.4	28	DEAD		
11	NRO	D	5.5	32	D	8.8	54	D	10.5	67
12	YP	D	6.3	40	D	9.5	62	D	12.2	72
13	BO	CD	2.9	28	I	5.3	43	I	6.4	52
14	SO	I	2.3	20	I	4.7	38	I	5.6	54
15	SO	CD	2.0	19	I	4.0	39	I	5.5	55
16	NRO	I	2.9	26	I	5.0	46	I	6.4	60
17	SO	I	2.3	21	I	3.7	39	DEAD		
18	WO	I	1.9	17	DEAD			DEAD		

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:
 D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #6

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	RM	CD	3.2	30	CD	6.6	52	CD	8.1	63
2	SO	I	1.6	19	DEAD			DEAD		
3	WO	I	1.8	17	DEAD			DEAD		
4	A	CD	3.5	33	D	9.0	62	D	12.2	70
5	BL	D	4.7	35	CD	6.3	48	I	7.1	63
6	YP	CD	2.9	31	CD	6.5	47	CD	9.0	62
7	SO	I	1.9	24	S	3.0	35	DEAD		
8	YP	CD	3.0	32	S	4.8	~	DEAD		
9	YP	CD	3.4	32	D	8.3	55	D	11.5	68
10	YP	I	2.5	27	CD	7.1	48	CD	9.9	61
11	H	I	1.7	20	S	2.4	27	DEAD		
12	YP	CD	3.2	29	CD	8.3	54	D	12.0	68
13	BC	CD	2.8	23	D	6.6	47	CD	9.4	61
14	YP	CD	2.3	26	CD	6.2	47	CD	8.4	63
15	H	I	2.2	19	S	3.6	33	S	3.7	38
16	BC	CD	2.8	21	CD	5.5	45	CD	7.4	58
17	RM	CD	2.1	23	I	3.7	41	I	4.3	51
18	RM	CD	2.4	24	CD	5.0	45	CD	6.8	59

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #7

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	SO	CD	2.5	25	CD	5.3	43	CD	7.1	56
2	SO	CD	2.2	22	I	4.5	42	I	5.2	55
3	RM	CD	2.7	26	I	3.7	42	S	3.9	45
4	YP	CD	3.8	29	CD	7.9	50	CD	10.4	63
5	BO	CD	2.8	25	CD	5.3	43	I	6.6	59
6	SO	CD	1.8	23	I	3.5	39	I	4.4	48
7	BO	CD	2.2	23	I	3.9	38	DEAD		
8	BO	CD	2.3	25	I	4.6	44	I	6.0	57
9	NRO	D	4.0	29	CD	8.3	52	D	11.4	68
10	BO	CD	2.6	24	I	4.8	43	I	6.0	57
11	SO	CD	2.5	24	I	5.6	44	I	6.9	54
12	SO	CD	2.4	22	I	5.2	43	I	6.9	57
13	YP	D	4.9	36	D	10.1	56	D	13.4	66
14	BO	CD	1.7	23	S	2.9	36	DEAD		
15	YP	CD	3.3	33	CD	7.1	52	CD	9.9	69
16	SO	CD	1.7	21	I	4.2	41	I	5.4	51
17	YP	D	4.2	34	CD	8.0	52	CD	9.7	68
18	BO	I	2.0	23	DEAD			DEAD		
19	BO	CD	2.2	26	I	4.6	42	DEAD		
20	SO	CD	2.0	24	I	4.3	42	I	5.4	54

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #8

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	CD	3.6	32	CD	6.1	51	CD	8.0	66
2	YP	D	4.5	34	D	9.4	52	D	11.2	64
3	YP	I	2.5	30	CD	6.4	50	CD	9.3	67
4	C	CD	3.7	32	I#	5.0	45	S	5.0	49
5	YP	CD	3.9	35	CD	7.9	50	CD	10.6	66
6	SO	I	2.3	24	I	4.0	40	S	4.3	48
7	NRO	CD	3.0	23	CD	5.5	44	CD	7.5	60
8	YP	D	3.2	29	D	7.8	50	CD	10.5	66
9	BC	CD	2.8	26	CD	5.0	45	CD	6.5	61
10	SO	I	1.7	21	I	3.9	42	I	4.5	62
11	YP	I	1.7	22	CD	4.5	45	CD	6.4	64
12	H	I	1.7	21	I	3.1	38	S	3.5	44
13	YP	CD	3.2	28	CD	6.2	52	CD	9.1	70
14	YP	I	2.5	27	D	7.0	52	CD	9.8	72
15	SO	D	3.7	28	CD	6.8	48	CD	8.8	60
16	BO	CD	2.8	27	I	4.5	39	DEAD		
17	NRO	CD	3.1	27	CD	6.8	47	CD	8.9	62
18	YP	CD	3.0	28	CD	6.8	50	CD	9.4	67

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Check Plot #9

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	SO	CD	2.0	25	DEAD			DEAD		
2	NRO	CD	3.2	30	CD	5.5	51	CD	7.3	63
3	A	D	4.2	32	D	8.7	56	D	10.9	71
4	SO	CD	2.8	26	I	5.1	47	DEAD		
5	YP	CD	3.2	28	CD	6.9	50	CD	9.4	67
6	A	D	4.8	40	D	9.8	68	D	13.6	78
7	A	D	4.9	40	D	9.7	67	D	12.7	79
8	NRO	D	3.8	27	CD	6.3	46	I	7.5	60
9	YP	CD	2.6	27	CD	6.1	53	CD	9.4	70
10	SO	CD	2.3	25	I	3.5	42	DEAD		
11	YP*	D	6.2	39	D	11.2	61	D	13.6	74
12	A	D	3.8	38	D	9.0	69	D	12.8	87
13	NRO	I	2.1	23	I	4.1	42	S	5.0	52
14	WO	I	2.4	25	S	3.3	35	DEAD		
15	NRO	CD	3.3	30	I	6.4	50	I	7.8	63
16	BO	I	2.5	25	I	4.5	42	I	5.4	54

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #1

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	BO	S	1.5	21	S	2.7	34	S	3.0	42
2	YP	CD	3.2	29	D	8.8	53	D	11.8	64
3	WO	CD	3.8	25	CD	7.3	40	CD	8.1	53
4	NRO	I	1.6	20	I	4.3	40	CD	6.0	60
5	YP	I	2.2	23	DEAD			DEAD		
6	WO	CD	3.2	25	CD	6.4	42	I	6.7	53
7	BO	CD	2.6	22	D	6.1	45	D	8.3	62
8	BO	CD	2.6	26	CD	5.6	42	CD	7.0	55
9	BO	CD	1.9	24	CD	5.2	42	CD	6.4	58
10	H	CD	3.1	25	CD	6.2	44	CD	7.6	53
11	BO	I	2.4	25	CD	5.9	41	CD	7.2	57
12	NRO	I	1.5	21	I	5.5	42	CD	7.7	60
13	BO	I	2.4	26	CD	5.7	44	CD	7.6	59
14	YP	CD	1.8	26	CD	6.5	48	CD	9.4	63
15	YP	CD	3.5	32	D	8.6	51	D	11.0	64
16	H	I	2.5	24	S#	4.4	32	S	4.5	38
17	YP	D	3.9	31	D	9.0	51	D	12.0	64
18	SM	I	1.7	25	CD	5.0	44	CD	6.7	54
19	BO	I	2.4	26	I	5.4	43	CD	6.6	55

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:
 D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #2

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	CD	2.9	30	CD	6.7	50	CD	9.3	64
2	BO	I	2.2	22	D	5.6	41	CD	7.6	57
3	BO	I	2.3	24	CD	5.1	40	I	6.2	52
4	NRO	CD	4.4	30	D	8.5	49	D	12.0	62
5	YP	I	2.9	35	CD	6.7	49	CD	9.9	63
6	BL	D	6.6	40	CD	8.8	44	CD	10.0	56
7	SO	I	2.7	26	I	5.2	42	I	6.2	58
8	BO	I	2.8	26	CD	6.5	43	CD	8.4	57
9	BO	S	2.1	24	DEAD			DEAD		
10	RM	CD	3.0	25	CD	6.3	40	CD	8.0	50
11	RM	I	3.4	28	CD	6.1	43	I	7.2	50
12	SO	I	1.9	20	I	3.5	37	DEAD		
13	RM	CD	3.8	34	D	7.5	43	CD	9.2	53
14	H	CD	3.9	27	I#	5.5	30	S	5.7	40
15	YP	I	2.0	25	DEAD#					
16	BL	D	5.8	43	CD#	7.6	46	CD	8.6	62
17	BO	I	2.0	21	I	3.9	36	I	4.5	49
18	YP	CD	3.2	27	D	8.1	45	D	11.3	61
19	SO	CD	2.7	21	CD	6.8	40	CD	8.8	58
20	BO	I	1.7	22	I	3.7	40	DEAD		

Species:
 YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:
Crown Class:
 D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:
 # = Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #3

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	WO	I	1.9	20	I	4.5	34	S	4.8	40
2	SO	CD	2.4	25	CD	6.7	48	CD	9.2	68
3	BO	CD	2.2	23	I	5.1	43	I	5.8	54
4	BO	CD	2.3	23	CD	5.7	43	I	7.2	59
5	SO	CD	2.3	26	CD	5.7	46	CD	7.4	62
6	YP	CD	1.8	24	D	7.1	50	D	10.5	67
7	YP	D	4.3	37	D	10.9	56	D	14.4	69
8	YP	CD	2.7	32	CD	7.7	55	I#	10.1	54
9	SO	CD	2.3	23	CD	5.3	40	CD	6.8	57
10	SO	I	2.5	21	I	4.4	37	DEAD		
11	SO	I	1.8	22	I	3.8	40	DEAD		
12	SO	I	2.4	22	CD	6.4	43	CD	8.4	61
13	YP	CD	2.3	25	CD	6.9	49	I#	9.9	56
14	YP	CD	3.5	30	D	9.3	56	D	12.2	67
15	WO	I	2.0	19	I	4.3	35	S	4.8	46
16	SM	I	1.8	22	I	4.6	41	S	5.7	52
17	BO	CD	3.2	27	CD	6.2	46	CD	7.5	63
18	YP	CD	2.9	29	D	6.7	45	CD	10.1	60
19	YP	CD	2.6	27	D	7.5	51	CD	11.2	62
20	SO	D	2.1	23	CD	5.6	37	I	6.8	50
21	BO	I	1.8	23	I	4.6	40	I	6.0	55
22	H	D	3.8	24	D	7.0	39	CD	8.3	51

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #4

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	CD	2.9	27	D	8.0	48	D	10.9	62
2	WO	CD	3.9	30	CD	8.4	47	CD	10.0	58
3	YP	CD	3.4	29	CD	7.3	45	CD	9.6	60
4	WO	I	2.5	24	I	6.1	42	I	7.2	52
5	BO	I	2.1	26	CD	5.1	43	I	6.2	56
6	SM	I	2.2	25	CD	5.1	42	I	6.0	52
7	BO	CD	3.4	28	S#	5.1	31	CD	6.7	57
8	YP	CD	2.7	30	CD	6.7	50	CD	9.0	65
9	YP	CD	2.8	29	D	7.9	52	D	11.3	65
10	YP	D	5.2	37	D	9.6	58	D	12.5	72
11	BO	I	2.4	22	I	5.4	39	I	6.8	53
12	SO	CD	3.0	28	D	7.8	48	D	10.4	64
13	NRO	CD	3.3	30	CD	7.1	48	CD	9.4	62
14	RM	D	4.6	32	D	9.2	50	CD	11.2	62
15	YP	CD	3.2	30	D	8.7	52	S#	10.5	48
16	SO	CD	2.8	28	CD	6.7	45	CD	8.6	60
17	YP	CD	2.8	28	CD	6.8	51	CD	9.0	66
18	YP	D	6.6	40	D	12.2	63	D	15.2	75

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #5

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	CD	4.2	34	D	8.6	54	D	10.9	68
2	RM	CD	2.7	29	CD	5.5	46	I	7.0	58
3	YP	D	4.9	38	D	9.6	55	D	12.0	72
4	YP	I	2.5	32	I	6.2	45	I	8.4	63
5	YP	D	5.3	38	D	11.0	61	D	14.8	76
6	NRO	D	5.8	31	D	11.4	54	D	14.8	70
7	YP	CD	3.4	31	CD	7.5	51	CD	9.2	68
8	RM	CD	2.9	30	CD	6.5	44	CD	8.5	56
9	YP	D	4.1	35	D	9.1	54	D	11.6	71
10	BO	I	2.4	25	I	5.8	43	I	7.5	57
11	RM	CD	3.1	26	I	4.9	44	I	6.3	57
12	RM	CD	2.4	28	I	4.6	40	I	5.6	53
13	SO	I	2.1	24	I	4.7	42	I	5.6	53
14	RM	CD	3.2	31	D	6.9	50	CD	9.0	59
15	BO	CD	3.6	31	D	8.1	47	D	11.0	65
16	NRO	CD	3.3	31	CD	7.2	47	CD	10.1	66
17	YP	CD	3.7	31	I#	6.9	41	I	7.4	62

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #6

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	SO	CD	2.6	27	I	4.7	45	DEAD		
2	YP	CD	2.6	29	CD	6.7	50	CD	9.2	64
3	YP	CD	3.8	34	CD	8.4	51	CD	10.6	66
4	YP	CD	3.2	30	D	8.3	52	D	11.1	69
5	NRO	CD	3.4	25	CD	7.1	43	CD	9.0	59
6	BO	I	1.7	22	S	2.6	33	DEAD		
7	SO	CD	2.6	24	I	5.3	43	I	6.6	52
8	YP	I	2.4	25	CD	6.6	49	CD	9.3	67
9	YP	CD	3.1	26	D	7.7	51	D	10.3	67
10	H	I	2.9	24	S	4.3	40	S	4.4	44
11	SO	I	2.3	25	I	4.8	42	I	5.5	57
12	A	D	4.3	34	D	11.0	67	D	15.1	77
13	WO	CD	2.9	22	I	5.0	39	S	5.2	47
14	WO	CD	2.8	23	I	4.5	37	S	4.5	44
15	YP	CD	4.2	31	CD	8.9	50	CD	10.8	64
16	YP	I	1.7	23	I	5.6	48	I	7.7	65
17	SO	CD	2.4	22	CD	6.0	46	I	8.2	56
18	YP	I	2.4	27	CD	6.8	50	CD	9.3	66

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:
 D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen

Thinned Plot #7

Tree No.	Species	Age 11			Age 20			Age 27		
		CC	DBH	HT	CC	DBH	HT	CC	DBH	HT
1	YP	CD	3.8	30	D	8.6	51	D	11.2	64
2	YP	CD	2.7	33	CD	6.7	52	CD	9.5	68
3	YP	CD	3.0	31	CD	7.0	51	CD	9.2	67
4	WO	I	1.9	19	S	3.5	33	S	3.6	36
5	SO	I	3.0	29	I	5.9	44	I	7.2	58
6	SO	I	2.6	25	CD	5.7	44	I	6.8	57
7	YP	CD	2.8	30	CD	6.5	49	CD	8.3	66
8	SO	D	3.1	30	CD	7.6	51	CD	10.0	64
9	NRO	CD	3.4	27	D	7.9	53	D	10.5	65
10	YP	I	2.0	26	CD	5.6	49	CD	8.0	67
11	BO	CD	2.8	29	I	5.2	45	I	6.2	54
12	YP	D	3.0	32	D	7.5	56	D	10.7	70
13	BO	D	3.9	33	D	7.5	49	CD	9.2	66
14	SO	I	2.6	24	CD	5.8	43	I	7.2	61
15	BO	CD	2.9	28	I	5.1	44	DEAD		
16	SO	CD	3.1	29	CD	7.0	46	CD	9.1	62
17	BO	D	4.1	32	D	8.1	50	CD	10.2	60
18	SO	CD	2.6	29	CD	6.2	45	CD	7.8	61
19	NRO	CD	3.9	29	D	7.3	50	CD	9.4	65
20	NRO	CD	2.6	29	CD	6.9	49	CD	9.5	66
21	SO	I	2.3	23	I	4.7	41	DEAD		

Species:

YP = Yellow-Poplar
 SO = Scarlet Oak
 BO = Black Oak
 NRO = Northern Red Oak
 WO = White Oak
 H = Hickory
 RM = Red Maple
 SM = Sugar Maple
 BL = Black Locust
 BC = Black Cherry
 A = Bigtooth Aspen
 C = Cucumber

Legend:

Crown Class:

D = Dominant
 CD = Co-Dominant
 I = Intermediate
 S = Suppressed

Miscellaneous:

= Severe Top Damage
 ~ = Top Bent Over or Broken Out
 ^ = Suppressed By Aspen