ALTERNATIVE VEGETATION MANAGEMENT TRIAL

EVALUATION REPORT

PROJECT 94-3-04

submitted to:

MANITOBA MODEL FOREST

by:

SYNTHEN RESOURCE SERVICES
WINNIPEG, MANITOBA

MARCH, 1995

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EXECUTIVE SUMMARY

The alternative vegetation management trial in the Manitoba Model Forest was established to evaluate several vegetation control alternatives that would reduce the overall use of herbicides in forest management. The trial, initiated in 1993, provides for a direct comparison of four alternative treatments including: the Seppi Forestry Mower, brush saws with a stump application of Vision, hand snapping and a ground Vision application using a skidder with a cluster nozzle applicator. Four replicates of each treatment were established on two 2 year old black spruce plantations with significant hardwood competition.

This first year evaluation report provides an analysis of both the impact on competing vegetation and the crop tree response at one year after treatment.

One year after treatment the ground application of Vision and brush saw/stump Vision applications provided the best aspen control, followed by the hand snapping and Seppi treatments. There were no significant differences in crop tree root collar diameters between the treatments. There appeared to be a significant difference in incremental height growth between treatments, however the treatment with the best height growths varied between the two sites.

1.0 INTRODUCTION

Over the last ten years herbicides have been used within the Model Forest area by Manitoba Natural Resources and Pine Falls Paper Company Limited (formerly Abitibi Price Inc.) for the control of competing vegetation and the subsequent enhancement in survival and growth of commercial softwood species on mixedwood sites. Herbicide treatment techniques have included both aerial and ground application using the most technically advanced and safe spray apparatus available on today's market. The majority of herbicide application has been carried out on upland spruce plantations, which are susceptible to intense competition during their establishment. Physical signs of this impact can often be seen within two to three years after planting. Herbicides have proven to be an effective and economical method of controlling competition.

Even though the total area treated in any one year comprises only a small component of the area harvested and regenerated, the continuous use of herbicides within the Model Forest area has been questioned. Concerns have arisen on the adverse effects of herbicides on wildlife, water resources and public safety.

Since ecological sustainable forest management is a primary objective of the Model Forest, a need was identified to carry out a study of alternative vegetation control in order to reduce the reliance on herbicides in the forest environment. The Model Forest project partners decided that four treatments would be evaluated and compared. The four treatments chosen were the Seppi Forestry Mower, hand snapping with a hinge remaining at approximately 45 centimetres, brush saws with a subsequent stump treatment with Vision and a ground application of Vision.

The objectives of this study were as follows:

1. To test and evaluate several vegetation management techniques (both chemical and mechanical) as to their short and long-term control of competing vegetation.

2. To monitor and compare the impact of these techniques on survival, growth and damage to the crop trees.

3. To compare the productivity and costs associated with each of these techniques.

4. To provide an area for the Model Forest to use as a demonstration site for other forest managers, resource specialists and the general public.

2.0 STUDY AREA DESCRIPTION

The study was carried out on two different sites within the Model Forest area. Site 1, which is located on the south side of the Beaver Creek Road at kilometre 7, was burned in 1989, and disc trenched and planted with black spruce in 1991. The topography is sloping, with rock outcroppings throughout the area. The site is well drained and the soils are deep clay loams. The competition is very high with the major competitive species being aspen, willow, cherry and raspberry. Site 2, which is located at the junction of PR 304 and the Rice River Road, was also burned in 1989, and disc trenched and planted in 1991. The area is flat, well drained and the soils are deep sandy loams. Competition is high, consisting mainly of aspen and willow. Both sites are ideal for the study since they represent a typical mixedwood black spruce plantation with severe competition. Figure 1 shows the general location of both study sites.

3.0 STUDY DESIGN AND METHODOLOGY

On each site, a series of four replicates were laid out, staked and labelled with its appropriate site and replicate number. The location of the replicates is presented in Figure 2 and 3. Each replicate consisted of five 10 x 30 m treatment blocks, laid out adjacent to each other. The treatment blocks were labelled as follows:

T1-Seppi Forestry Mower
T2-Hand snapping
T3-Brush Saw with stump application of a 40% concentrate solution of glyphosate (Vision)

FIGURE 1

FIGURE 2

FIGURE 3

T4-Control, no treatment
T5-Ground application of glyphosate (2.5 L/Ha using a skidder and cluster nozzle applicator)

A minimum 5 metre buffer was established between each of the treatments, with the exception of treatment five (T5) which had a minimum ten metre buffer. Buffers were necessary to ensure that treatment results were not affected by adjacent treatments.

Prior to treatment, two milli-hectare circular permanent plots were established in each of the treatment blocks. The first plots were located five metres in from the sides of the blocks and ten metres from the front of the blocks. The second plots were also located five metres from the sides but were located 10 metres from the back of the blocks. In each of these plots, density and average heights for trembling aspen and balsam poplar were recorded. An estimate of percent cover for aspen, shrubs (greater than 0.5 metres tall) and ground cover was also recorded. Once the measurements were completed, treatments were carried out in each of the blocks. The Seppi and hand snapping was done in early June, while the brush saw and ground application of Vision was carried out in mid-August. Crop tree measurements were completed immediately after treatment.

Ten crop trees were selected, measured, pinned and labelled in each of the treatment blocks. Crop trees which were closer than 1.5 metres from the edge of the blocks were not selected. Crop tree measurements included root collar diameters and heights. The crop trees were also assigned a code which represented damage caused by the treatment. The classifications for the damage codes are :

1.No damage
2.Top broken or damaged
3.Leaning greater than 45°, but minor physical damage
4.Leaning greater than 45°, with severe damage

In order not to bias the study, crop trees were selected in a consistent systematic fashion. Using the first milli-hectare plot as a starting point, the immediate five crop trees on either side of the plot pin were selected. This survey design worked for most treatments, however the design was altered slightly in blocks with missed spots or inconsistent planting.

Several other areas alongside the replicates were treated with the Seppi and ground chemical applicator. These were established for demonstration purposes and to provide a larger treatment area for the productivity analysis. Five demonstration areas totalling 3.6 hectares were treated. Time analysis was also done on the other two treatments while completing the replicates.

Plot layout, initial measurements and actual treatments were carried out in 1993. Since it would take several years to obtain any conclusive results, additional measurements and evaluations are scheduled in each of the remaining years of the current Model Forest program. The balance of this report deals with the findings of this study one year after initial treatment.

4.0FIRST YEAR REMEASUREMENT METHODOLOGY

The first remeasurement was completed during the month of August 1994, approximately one year after initial treatment. It was critical that remeasuring be completed during late summer to ensure that the crop trees were fully flushed and had set bud. The milli-hectare plots were first located and remeasured. Stem density and average heights for trembling aspen and balsam poplar were recorded, as well as an estimate of percent cover for poplar, shrubs and ground cover. The selected crop trees were relocated and remeasured for root collar diameter and total height. The crop trees were also re-assigned a damage code, which represented the damage suffered to the crop tree caused by the treatment. The same codes were used as in the previous year with the exception of a code "0" which was added to the list and assigned to dead crop trees. Damaged and missing pins and labels used for identifying and relocating the crop trees were replaced if needed.

Data was entered on a computer and analyzed using the MS-Works spreadsheet program. Analysis and result calculations are presented in the following section.

5.0 FIRST YEAR RESULTS AND DISCUSSION

Competing Vegetation

Tables 1 and 2 summarize competition data collected for 1993 and 1994 for both sites. As can be seen the effectiveness of each treatment in controlling competing hardwoods and ground vegetation varied greatly. Ground application of Vision was the most effective treatment eliminating virtually all the poplar. The brush saw and subsequent stump application of Vision was also very successful in controlling hardwood competition. Very little suckering occurred, which typically tends to be a

problem when only a brushsaw treatment is used. The hand snapping and seppi treatments yielded much poorer results. Although hardwood density and percent cover was lower in both of these treatments, heavy suckering was occurring on both sites. Ideally these treatments should only damage and weaken the hardwood stems. This in turn causes the tree to spend the majority of its energy in trying to repair itself instead of into sucker development. In this case however, the treatments killed most of the stems which in turn induced suckering.

The data showed that shrub and herbaceous ground cover increased following both manual treatments. This was mainly due to a decrease in the hardwood canopy cover. This was also the case in the two chemical treatments although the increase in ground cover was much lower. Competition levels within the control (untreated) blocks also increased over the year. Although the average poplar stem density decreased in the control blocks on both sites, the percent tree cover increased overall. The percent cover also increased for the shrubs and ground vegetation. This percent cover increase can probably be attributed to the fact that the remeasurements were done in August when foliage and canopy cover is very dense, unlike early June when the initial measurements were taken and vegetation was just leafing out.

Crop Tree Response

To determine the effects of the five different release treatments on crop tree response, it was decided that a statistical (2 x 5) factorial test would be used for the analysis. This test was selected since it could be used to determine if any significant differences existed in growth response between each of the five treatments on the different sites. Growth response was measured in terms of root collar diameter growth (RCD) and height growth beginning from time of treatment to time of re-measurement (one growing season). Growth increments for RCD and height are summarized in Tables 3 and 4 respectively.

Results of the factorial test are summarized in a two-way anova table (Tables 5 and 6). The test was conducted at two confidence levels, 95 percent and 99 percent as indicated in the last two columns of the anova table. An asterisk indicates that there is a significant difference in the factors where as "NS" signifies that there is no significant difference.

According to the anova tables, there was no significant difference between any of the release treatments when comparing root collar diameter growth. There was however a significant difference when comparing height response. This is somewhat surprising since the treatments were only carried out a year ago. One would expect that several growing seasons would have to pass by,

before the crop trees would start responding to the release. It is still however, too early in the study to determine which treatment is most effective in terms of growth response.

Significant differences existed at 95% confidence level between the two sites when comparing diameter and height. At a higher confidence level, differences existed only for the height. This would suggest that site probably has more of an influence on height than it does on RCD.

The site release interaction remained non-significant for both diameter and height, suggesting that site and release treatments act independently of each other.

Tree Mortality and Damage

The treatment with the highest incidence of crop tree mortality was the ground application of Vision. Eleven trees out of a possible 80 were found dead. Many of the deaths were a result of the skidder running over the trees. It is unlikely that any of the trees died from the herbicide itself. The Seppi also had a high incidence of mortality. Again this was the result of equipment running over the trees. The brush saw treatment had a lower rate of mortality, only four crop trees were found dead. However, tree damage was extensive, a result of the brush saws snipping off the tops. The hand snapping yielded the best results. All of the crop trees were

Table 1 : Competition Summary for Site 1

TREATMENT	AVERAGE STEM DENSITY	AVERAGE STEM HEIGHT	PERCENT COVER		
			TREE	SHRUB	GROUND
Seppi					
1993	24	2.9	29	38	38
1994	11	1.5	15	70	92
Hand Snapping					
1993	16	2.4	29	56	33
1994	7	1.3	9	87	55
Brush Saw					
1993	26	3.4	48	24	43
1994	7	0.8	4	43	52
Control					
1993	24	3.3	40	51	34
1994	16	4.1	50	80	49
Ground Application					
1993	33	3.3	49	23	51
1994	1	0.7	1	33	75

Table 2 : Competition Summary for Site 2

TREATMENT	AVERAGE STEM DENSITY	AVERAGE STEM HEIGHT	PERCENT COVER		
			TREE	SHRUB	GROUND
Seppi					
1993	33	2.5	39	26	48
1994	13	1.3	25	46	86
Hand Snapping					
1993	35	3.4	60	29	38
1994	17	1.4	35	49	86
Brush Saw					
1993	18	1.9	28	29	26
1994	4	0.7	1	34	65
Control					
1993	19	2.2	29	26	53
1994	18	3.9	54	58	78
Ground Application					

1993	24	2.3	34	27	45
1994	1	0.5	0	18	83

Table 3 : Mean RCD (cm) Incremental Growth

SITE 1	RELEASE TREATMENT	REPLICATES				RELEASE TREATMENT SUBTOTALS	SITE TOTALS
		1	2	3	4		
	Seppi	0.54	0.37	0.29	0.52	1.72	
	Snapping	0.56	0.57	0.55	0.31	1.98	
	Brush Saw	0.37	0.65	0.33	0.38	1.73	
	Control	0.29	0.31	0.19	0.30	1.09	
	Broadcast	0.37	0.61	0.08	0.59	1.66	
BLOCK SUBTOTALS		**2.12**	**2.51**	**1.43**	**2.11**		**8.17**
SITE 2	**RELEASE TREATMENT**	**REPLICATES**				**RELEASE TREATMENT SUBTOTALS**	**SITE TOTALS**
		1	**2**	**3**	**4**		
	Seppi	0.36	0.57	0.30	0.26	1.48	
	Snapping	0.29	0.32	0.33	0.31	1.25	
	Brush Saw	0.52	0.34	0.28	0.27	1.42	
	Control	0.30	0.32	0.12	0.14	0.87	
	Broadcast	0.38	0.32	0.48	0.24	1.41	
BLOCK SUBTOTALS		**1.83**	**1.86**	**1.50**	**1.22**		**6.42**

Table 4 : Mean Height (m) Incremental Growth

SITE 1	RELEASE TREATMENT	REPLICATES				RELEASE TREATMENT SUBTOTALS	SITE TOTALS
		1	2	3	4		
	Seppi	0.33	0.30	0.28	0.39	1.31	
	Snapping	0.40	0.42	0.44	0.29	1.55	
	Brush Saw	0.16	0.37	0.21	0.16	0.90	
	Control	0.30	0.41	0.15	0.24	1.10	
	Broadcast	0.35	0.36	0.28	0.39	1.38	
BLOCK SUBTOTALS		**1.53**	**1.86**	**1.36**	**1.47**		**6.23**
SITE 2	**RELEASE**	**REPLICATES**				**RELEASE**	**SITE**

	TREATMENT					TREATMENT SUBTOTALS	TOTALS
		1	2	3	4		
	Seppi	0.27	0.30	0.30	0.23	1.10	
	Snapping	0.22	0.21	0.28	0.22	0.92	
	Brush Saw	0.26	0.19	0.11	0.15	0.71	
	Control	0.24	0.20	0.08	0.15	0.68	
	Broadcast	0.25	0.24	0.28	0.13	0.90	
BLOCK SUBTOTALS		**1.23**	**1.14**	**1.06**	**0.88**		**4.31**

Table 5

Two-Way Anova Table
Root Collar Diameter

SOURCE	DF	SS	MS	F	0.01	0.05
Replicates	3	0.1225956	0.0408652	2.9028552	ns	ns
Treatments	9	0.2477103	0.0275234	1.9551199	ns	ns
Site	1	0.0770511	0.0770511	5.4733187	ns	**
Release	4	0.1472515	0.0368129	2.6149993	ns	ns
Site/Release	4	0.0234077	0.0058519	0.4156907	ns	ns
Error	27	0.3800949	0.0140776			
TOTAL	**39**	**0.7504008**				

Table 6

Two-Way Anova Table
Height

SOURCE	DF	SS	MS	F	0.01	0.05
Replicates	3	0.0280795	0.0093598	2.3202301	ns	ns
Treatments	9	0.1859953	0.0206661	5.1229756	**	**
Site	1	0.0920275	0.0920275	22.812888	**	**
Release	4	0.0772849	0.0193212	4.7895807	**	**
Site/Release	4	0.0166829	0.0041707	1.0338923	ns	ns
Error	27	0.0189183	0.004034			
TOTAL	**39**	**0.3229932**				

still alive and only two were damaged. This treatment does not harm the crop trees (unlike the other treatments), since no machinery is used.the control had a total of five dead trees. Heavy aspen competition and a lack of sunlight was probably a contributing factor leading to the death of the trees. Table 7 lists the mortality rates and damage sustained by the crop trees for all five treatments.

6.0 RECOMMENDATIONS

The findings of both the 1993 initial establishment report and this report one year after treatment have shown that each treatment has its advantages and disadvantages and are suited for different situations. The seppi for example has a higher productivity rate than the manual treatments and it doesn't use herbicides. The disadvantages are its high operating costs, its tendency to damage crop trees and based on this one trial, its apparent inability to minimize aspen suckering. Other studies using the Seppi have demonstrated better sucker control. These differences could be related to the size of the aspen at the time of treatment, the site or the actual time of treatment during the growing season. Further research is required to determine the significance of these factors.

The ground Vision application is productive, extremely cost effective and is highly successful in controlling competing vegetation. The main disadvantages appear to be the extensive damage to the crop trees and the continued reliance on the herbicide option. The extensive crop tree mortality probably precludes this option from replacing the aerial Vision applications

that are typically used in these circumstances in the Model Forest.

The brush saw with subsequent chemical stump application is very successful at controlling vegetation and even though it makes use of herbicides, the application is very selective and uses much less chemical than broadcast aerial or other ground applications. Its main disadvantages are its high cost and low productivity rate.

The main advantages of the hand snapping technique are that it makes no use of chemicals or machinery which can harm the crop trees and it creates very little site disturbance. The

Table 7

Crop Tree Mortality and Damage Summary for both Sites

TREATMENT	TOTAL NUMBER					TOTAL DAMAGED & DEAD
	UNDAMAGED TREES	TREES WITH DAMAGED TOPS	TREES LEANING GREATER THAN 45°, WITH MINOR DAMAGE	TREES LEANING GREATER THAN 45°, WITH SEVERE DAMAGE	DEAD TREES	
Seppi	68	0	0	2	10	12
Hand Snapping	78	0	2	0	0	2
Brush Saw/ Stump Applicator	67	5	2	2	4	13
Control	74	0	1	0	5	6
Ground Herbicide	64	0	5	0	11	16

disadvantages are the apparent inability to control suckering, its high cost and its low productivity rate. This system would be best suited in riparian or other sensitive areas.

As far as growth response, several years will be required until any conclusive results are obtained.

March 21, 1995

Mr. Mike Waldram
General Manager
Manitoba Model Forest
P.O. Box 10
Pine Falls, Manitoba
R0E 1M0

Dear Mike:

RE: MODEL FOREST PROJECT #94-3-04
ALTERNATIVE VEGETATION MANAGEMENT

Please find enclosed two final reports for the above noted project. Since this fulfils our contractual obligations under this project we have submitted our final invoice. Should there be any questions or additional information required, please give us a call.

I have enclosed an additional copy of both reports for Vince. Would you please pass these on. Thanks.

Yours truly,

G. Ardron
Partner

GA/jl

Encl(s).

I N V O I C E

DATE:March 21, 1995

TO:Mike Waldram
Manitoba Model Forest
P.O. Box 10
Pine Falls, Manitoba
R0E 1M0

RE:Model Forest Project #94-3-04
Alternative Vegetation Management

Completion and Delivery of
Final Project Documents ..... $ 3,644.86

GST @ 7% 255.14

TOTAL THIS INVOICE $ 3,900.00

Gary Ardron

GST #138 142 708

APPENDICES

COMPETITION 1993 MEASUREMENTS

Treatment Block	# Stems/plot	Average Height (m)	Hardwoods	Shrubs	Ground Cover
s1r1t1p1	39	4.0	30	50	90
s1r1t1p2	31	5.0	40	10	20
s1r1t2p1	10	2.0	5	10	80
s1r1t2p2	41	3.5	50	30	20
s1r1t3p1	51	4.5	90	20	10
s1r1t3p2	16	3.5	20	30	40
s1r1t4p1	52	5.0	80	50	5
s1r1t4p2	29	3.0	30	20	40
s1r1t5p1	33	3.0	60	60	30
s1r1t5p2	45	2.5	60	20	70
s1r2t1p1	9	2.0	5	60	20
s1r2t1p2	11	2.0	10	30	10
s1r2t2p1	1	1.5	1	70	60
s1r2t2p2	26	3.0	50	60	20
s1r2t3p1	26	3.5	60	5	30
s1r2t3p2	0		0	30	50
s1r2t4p1	32	4.0	80	30	20
s1r2t4p2	19	3.5	30	70	30
s1r2t5p1	43	4.0	70	10	30
s1r2t5p2	17	3.5	20	5	30
s1r3t1p1	18	1.5	20	20	30
s1r3t1p2	29	2.5	60	60	20
s1r3t2p1	2	1.5	1	90	1
s1r3t2p2	34	4.0	90	80	20
s1r3t3p1	47	4.5	80	1	30
s1r3t3p2	24	3.0	60	70	20
s1r3t4p1	8	3.5	20	90	50
s1r3t4p2	32	4.0	70	60	30
s1r3t5p1	19	2.5	30	30	50
s1r3t5p2	43	4.0	60	20	30
s1r4t1p1	19	2.5	20	40	30
s1r4t1p2	38	3.5	50	30	80
s1r4t2p1	5	1.5	5	70	30
s1r4t2p2	12	2.5	30	40	30
s1r4t3p1	12	2.5	30	5	60
s1r4t3p2	31	2.5	40	30	100
s1r4t4p1	1	2.0	1	80	80
s1r4t4p2	15	1.5	10	10	20
s1r4t5p1	41	4.0	60	10	80
s1r4t5p2	25	3.0	30	30	90
s2r1t1p1	46	3.0	70	20	10

s2r1t1p2	44	2.0	40	20	50
s2r1t2p1	25	2.5	60	10	10
s2r1t2p2	47	3.0	60	0	10
s2r1t3p1	26	2.5	40	20	30
s2r1t3p2	42	2.0	50	20	10
s2r1t4p1	26	2.0	60	20	20
s2r1t4p2	40	3.5	60	20	30
s2r1t5p1	20	2.0	40	40	20
s2r1t5p2	18	2.5	40	30	60
s2r2t1p1	40	2.5	40	0	30
s2r2t1p2	38	2.5	40	10	20
s2r2t2p1	35	2.0	40	10	60
s2r2t2p2	44	3.0	60	0	50
s2r2t3p1	8	1.0	10	20	10
s2r2t3p2	16	1.5	30	10	10
s2r2t4p1	12	1.5	10	0	40
s2r2t4p2	20	2.5	20	10	70
s2r2t5p1	42	2.5	50	10	60
s2r2t5p2	32	2.5	40	10	80
s2r3t1p1	16	1.5	10	60	90
s2r3t1p2	30	4.0	60	10	70
s2r3t2p1	39	4.0	60	70	60
s2r3t2p2	29	4.5	60	60	20
s2r3t3p1	18	2.0	30	20	100
s2r3t3p2	12	3.0	10	80	10
s2r3t4p1	17	1.5	30	5	90
s2r3t4p2	20	3.0	40	60	70
s2r3t5p1	24	2.0	30	50	30
s2r3t5p2	32	1.5	30	5	50
s2r4t1p1	26	3.0	30	30	40
s2r4t1p2	21	1.5	20	60	70
s2r4t2p1	24	3.5	50	20	30
s2r4t2p2	33	5.0	90	60	60
s2r4t3p1	13	2.0	40	30	20
s2r4t3p2	12	1.5	10	30	20
s2r4t4p1	13	3.0	20	30	40
s2r4t4p2	21	3.0	30	60	50
s2r4t5p1	14	2.5	20	30	30
s2r4t5p2	12	2.5	20	40	30

COMPETITION 1994 MEASUREMENTS

Treatment Block	# Stems/plot	Average Height (m)	Hardwoods	Shrubs	Ground Cover
s1r1t1p1	17	1.5	25	55	99
s1r1t1p2	16	1.5	20	30	99
s1r1t2p1	8	1.1	15	30	95
s1r1t2p2	15	1.6	25	85	80
s1r1t3p1	8	0.7	5	70	50
s1r1t3p2	7	0.8	5	40	70
s1r1t4p1	36	5.0	85	60	40
s1r1t4p2	24	4.0	60	70	40
s1r1t5p1	0		0	15	99
s1r1t5p2	0		0	80	80
s1r2t1p1	3	1.8	2	100	80
s1r2t1p2	9	1.4	10	95	80
s1r2t2p1	0		0	99	70
s1r2t2p2	13	1.5	25	100	30
s1r2t3p1	4	0.7	1	40	70
s1r2t3p2	2	0.8	1	30	99
s1r2t4p1	22	4.5	90	40	80
s1r2t4p2	13	4.0	55	85	80
s1r2t5p1	1	0.6	1	10	50
s1r2t5p2	1	0.5	1	10	75
s1r3t1p1	11	1.6	25	30	99
s1r3t1p2	9	1.5	20	75	99
s1r3t2p1	0		0	100	5
s1r3t2p2	8	1.2	5	90	90
s1r3t3p1	9	0.6	5	30	30
s1r3t3p2	4	0.6	1	15	30
s1r3t4p1	4	4.5	20	99	5
s1r3t4p2	19	4.5	70	99	20
s1r3t5p1	0		0	50	80
s1r3t5p2	1	0.9	1	50	75
s1r4t1p1	8	1.5	10	80	90
s1r4t1p2	11	1.4	10	95	90
s1r4t2p1	3	1.1	1	95	40
s1r4t2p2	6	1.5	3	99	30
s1r4t3p1	18	1.0	10	65	45
s1r4t3p2	3	0.9	1	50	25
s1r4t4p1	1	2.4	1	99	50
s1r4t4p2	7	3.5	15	90	80
s1r4t5p1	1	0.8	1	15	70
s1r4t5p2	1	0.7	1	30	70
s2r1t1p1	16	1.8	30	50	90

s2r1t1p2	28	1.6	60	30	90
s2r1t2p1	23	1.2	60	30	90
s2r1t2p2	32	1.5	60	20	90
s2r1t3p1	3	0.7	1	5	40
s2r1t3p2	2	0.7	1	30	75
s2r1t4p1	31	3.5	80	30	90
s2r1t4p2	34	3.5	70	20	100
s2r1t5p1	0	0.0	0	5	50
s2r1t5p2	0	0.0	0	1	80
s2r2t1p1	23	1.1	50	10	90
s2r2t1p2	6	1.0	10	25	95
s2r2t2p1	22	1.4	60	10	90
s2r2t2p2	16	1.2	40	20	100
s2r2t3p1	3	0.7	1	5	70
s2r2t3p2	5	0.5	1	5	75
s2r2t4p1	6	3.5	20	40	90
s2r2t4p2	19	4.0	60	25	100
s2r2t5p1	2	1.5	1	10	95
s2r2t5p2	0		0	10	90
s2r3t1p1	15	1.4	25	80	60
s2r3t1p2	7	1.0	10	30	100
s2r3t2p1	10	1.6	25	80	60
s2r3t2p2	15	1.7	25	75	90
s2r3t3p1	1	0.9	1	60	80
s2r3t3p2	3	0.9	1	50	65
s2r3t4p1	16	4.5	60	80	35
s2r3t4p2	14	5.0	50	90	60
s2r3t5p1	1	0.7	1	15	100
s2r3t5p2	0		0	30	95
s2r4t1p1	6	1.2	10	70	90
s2r4t1p2	3	1.1	5	70	70
s2r4t2p1	6	1.3	5	60	90
s2r4t2p2	8	1.1	5	95	80
s2r4t3p1	8	0.8	1	60	75
s2r4t3p2	3	0.6	1	60	40
s2r4t4p1	10	3.5	30	85	85
s2r4t4p2	13	4.0	60	90	60
s2r4t5p1	2	0.6	1	50	70
s2r4t5p2	0		0	25	85

CROP TREES 1993 MEASUREMENTS

Treatment Block	Tree #	Damage Code	R.C.D. (cm)	Height (m)
s1r1t1	1	1	0.64	0.43
	2	1	0.76	0.71
	3	1	0.70	0.56
	4	1	0.70	0.62
	5	1	0.72	0.52
	6	1	0.42	0.43
	7	3	0.80	0.00
	8	4	0.30	0.00
	9	1	0.82	0.60
	10	1	0.87	0.65
s1r1t2	1	1	0.83	0.73
	2	1	0.85	0.62
	3	1	0.56	0.58
	4	1	0.87	0.73
	5	1	0.62	0.53
	6	1	0.71	0.55
	7	1	0.79	0.44
	8	1	0.69	0.67
	9	1	0.54	0.36
	10	3	0.59	0.16
s1r1t3	1	1	0.56	0.42
	2	1	0.37	0.28
	3	1	0.82	0.68
	4	1	0.72	0.54
	5	1	0.73	0.46
	6	1	0.85	0.53
	7	2	0.73	0.37
	8	1	0.75	0.60
	9	1	0.42	0.38
	10	1	0.51	0.35
s1r1t4	1	1	0.45	0.31
	2	1	0.73	0.56
	3	1	0.76	0.57
	4	1	0.37	0.36
	5	1	0.76	0.52
	6	1	0.69	0.60
	7	1	0.57	0.66
	8	1	0.50	0.39
	9	1	0.43	0.41
	10	1	0.52	0.50

s1r1t5	1	3	0.67	0.28
	2	3	0.67	0.24
	3	1	0.78	0.61
	4	3	0.88	0.00
	5	3	1.15	0.41
	6	1	0.98	0.46
	7	1	0.77	0.78
	8	1	0.74	0.63
	9	1	0.96	0.99
	10	1	1.03	0.77
s1r2t1	1	1	0.90	0.62
	2	1	0.80	0.61
	3	1	0.75	0.49
	4	1	0.91	0.65
	5	4	0.78	0.20
	6	1	0.55	0.49
	7	1	0.55	0.49
	8	3	0.45	0.24
	9	1	0.59	0.27
	10	1	0.71	0.49
s1r2t2	1	1	0.61	0.52
	2	1	0.73	0.70
	3	1	1.18	0.87
	4	1	1.14	0.80
	5	1	1.21	0.87
	6	1	0.69	0.68
	7	1	0.91	0.77
	8	1	0.72	0.63
	9	1	0.75	0.66
	10	1	0.71	0.60
s1r2t3	1	1	1.30	0.93
	2	1	0.85	0.54
	3	1	0.77	0.54
	4	1	0.54	0.34
	5	1	0.60	0.36
	6	2	1.02	0.68
	7	1	0.82	0.58
	8	1	0.68	0.42
	9	1	1.09	0.67
	10	2	0.91	0.85
s1r2t4	1	1	0.34	0.41
	2	1	1.14	0.76
	3	1	0.87	0.71
	4	1	0.49	0.37
	5	1	1.15	1.01

	6	1	0.96	0.72
	7	1	0.86	0.73
	8	1	0.81	0.70
	9	1	0.73	0.71
	10	3	0.91	0.40
s1r2t5	1	1	1.39	0.70
	2	1	1.04	0.64
	3	1	0.67	0.59
	4	1	0.68	0.51
	5	1	0.78	0.59
	6	1	0.93	0.67
	7	1	0.63	0.55
	8	1	0.58	0.61
	9	1	0.58	0.49
	10	1	1.03	0.68
s1r3t1	1	1	0.73	0.62
	2	1	0.65	0.53
	3	4	0.46	0.00
	4	1	0.82	0.42
	5	3	0.53	0.30
	6	1	0.42	0.39
	7	1	0.54	0.42
	8	2	0.72	0.58
	9	1	0.91	0.82
	10	1	0.54	0.47
s1r3t2	1	1	0.74	0.64
	2	1	0.80	0.60
	3	1	0.71	0.62
	4	1	0.80	0.60
	5	1	0.96	0.96
	6	1	0.71	0.53
	7	1	0.57	0.33
	8	1	0.76	0.78
	9	1	0.76	0.71
	10	1	0.73	0.41
s1r3t3	1	1	0.99	0.59
	2	1	0.73	0.57
	3	1	0.75	0.52
	4	1	0.62	0.53
	5	2	0.75	0.48
	6	2	0.68	0.36
	7	1	0.55	0.50
	8	1	0.72	0.64
	9	1	0.88	0.68
	10	1	0.75	0.68

s1r3t4	1	1	0.31	0.31
	2	1	0.83	0.90
	3	1	0.79	0.57
	4	1	0.64	0.48
	5	1	0.55	0.53
	6	1	0.53	0.58
	7	1	1.17	0.87
	8	1	0.50	0.51
	9	1	0.69	0.51
	10	1	0.67	0.64
s1r3t5	1	1	0.60	0.54
	2	1	0.92	0.60
	3	1	0.95	0.47
	4	3	0.79	0.00
	5	3	0.65	0.39
	6	3	1.12	0.22
	7	1	1.27	1.10
	8	3	0.74	0.10
	9	1	0.83	0.64
	10	1	0.55	0.45
s1r4t1	1	3	0.70	0.00
	2	1	0.10	0.18
	3	3	0.61	0.00
	4	1	0.53	0.47
	5	1	0.70	0.64
	6	4	0.30	0.00
	7	3	0.26	0.08
	8	2	0.82	0.72
	9	1	0.56	0.44
	10	1	0.41	0.55
s1r4t2	1	1	1.02	0.79
	2	1	0.83	0.65
	3	1	0.80	0.84
	4	1	0.46	0.34
	5	1	0.70	0.61
	6	1	0.53	0.47
	7	1	0.38	0.39
	8	1	0.69	0.51
	9	1	0.36	0.36
	10	1	0.45	0.53
s1r4t3	1	2	0.69	0.48
	2	1	0.23	0.29
	3	1	0.37	0.25
	4	1	0.63	0.43
	5	1	0.79	0.47

	6	2	0.76	0.32
	7	1	0.22	0.34
	8	1	0.34	0.30
	9	1	0.40	0.51
	10	2	0.77	0.64
s1r4t4	1	1	0.69	0.58
	2	1	0.59	0.73
	3	1	0.46	0.31
	4	1	0.95	0.60
	5	1	0.34	0.36
	6	1	0.77	0.65
	7	1	0.81	0.40
	8	2	0.80	0.51
	9	1	0.61	0.57
	10	1	0.51	0.57
s1r4t5	1	2	0.69	0.48
	2	1	0.23	0.29
	3	1	0.37	0.25
	4	1	0.63	0.43
	5	1	0.79	0.47
	6	2	0.76	0.32
	7	1	0.22	0.34
	8	1	0.34	0.30
	9	1	0.40	0.51
	10	2	0.77	0.64
s2r1t1	1	1	0.48	0.42
	2	3	0.37	0.10
	3	1	0.49	0.34
	4	1	0.40	0.29
	5	1	0.40	0.35
	6	1	0.49	0.39
	7	1	0.47	0.28
	8	1	0.25	0.28
	9	3	0.44	0.15
	10	1	0.38	0.34
s2r1t2	1	1	0.36	0.35
	2	1	0.41	0.43
	3	1	0.38	0.33
	4	1	0.29	0.29
	5	1	0.49	0.33
	6	1	0.42	0.43
	7	1	0.38	0.37
	8	1	0.37	0.36
	9	1	0.42	0.46
	10	1	0.38	0.34

s2r1t3	1	1	0.58	0.37
	2	1	0.54	0.40
	3	1	0.34	0.26
	4	1	0.56	0.39
	5	1	0.54	0.37
	6	1	0.62	0.41
	7	1	0.49	0.40
	8	1	0.68	0.48
	9	1	0.63	0.46
	10	1	0.45	0.27
s2r1t4	1	1	0.58	0.50
	2	1	0.48	0.20
	3	1	0.35	0.29
	4	1	0.44	0.42
	5	1	0.58	0.45
	6	1	0.48	0.39
	7	1	0.40	0.32
	8	1	0.47	0.41
	9	1	0.38	0.16
	10	1	0.55	0.52
s2r1t5	1	1	0.36	0.34
	2	1	0.46	0.38
	3	1	0.50	0.43
	4	1	0.73	0.49
	5	1	0.54	0.38
	6	1	0.41	0.33
	7	1	0.37	0.30
	8	1	0.56	0.42
	9	1	0.64	0.48
	10	1	0.51	0.35
s2r2t1	1	3	0.39	0.16
	2	1	0.53	0.38
	3	1	0.32	0.22
	4	1	0.52	0.41
	5	3	0.44	0.10
	6	1	0.23	0.37
	7	1	0.32	0.37
	8	1	0.42	0.43
	9	1	0.43	0.46
	10	1	0.46	0.42
s2r2t2	1	1	0.49	0.39
	2	1	0.35	0.34
	3	1	0.43	0.35
	4	1	0.26	0.32
	5	1	0.39	0.32

	6	1	0.39	0.36
	7	1	0.39	0.39
	8	1	0.45	0.40
	9	1	0.41	0.41
	10	1	0.32	0.34
s2r2t3	1	1	0.47	0.22
	2	1	0.48	0.30
	3	1	0.48	0.39
	4	1	0.40	0.15
	5	1	0.48	0.28
	6	1	0.41	0.26
	7	2	0.71	0.47
	8	1	0.42	0.36
	9	1	0.44	0.42
	10	1	0.33	0.35
s2r2t4	1	1	0.28	0.29
	2	1	0.46	0.29
	3	1	0.45	0.32
	4	1	0.51	0.38
	5	1	0.36	0.42
	6	1	0.47	0.39
	7	1	0.38	0.18
	8	1	0.43	0.34
	9	1	0.43	0.37
	10	1	0.50	0.35
s2r2t5	1	1	0.68	0.43
	2	1	0.53	0.40
	3	3	0.32	0.00
	4	1	0.28	0.39
	5	1	0.33	0.29
	6	1	0.47	0.34
	7	1	0.38	0.20
	8	1	0.32	0.21
	9	1	0.58	0.39
	10	1	0.46	0.29
s2r3t1	1	3	0.41	0.08
	2	1	0.37	0.34
	3	3	0.46	0.00
	4	1	0.32	0.36
	5	1	0.53	0.43
	6	1	0.41	0.37
	7	1	0.36	0.38
	8	1	0.42	0.30
	9	1	0.38	0.42
	10	3	0.40	0.22

s2r3t2	1	1	0.31	0.33
	2	1	0.40	0.44
	3	1	0.53	0.47
	4	1	0.48	0.42
	5	1	0.42	0.38
	6	1	0.37	0.31
	7	1	0.39	0.36
	8	1	0.32	0.37
	9	1	0.24	0.31
	10	1	0.44	0.31
s2r3t3	1	1	0.44	0.29
	2	1	0.36	0.34
	3	1	0.53	0.32
	4	1	0.54	0.42
	5	1	0.37	0.41
	6	1	0.33	0.28
	7	1	0.40	0.44
	8	1	0.39	0.42
	9	1	0.37	0.35
	10	1	0.44	0.39
s2r3t4	1	1	0.41	0.47
	2	1	0.46	0.50
	3	1	0.36	0.40
	4	1	0.29	0.35
	5	1	0.38	0.45
	6	1	0.37	0.30
	7	1	0.33	0.33
	8	1	0.41	0.44
	9	1	0.41	0.48
	10	1	0.30	0.36
s2r3t5	1	1	0.50	0.50
	2	1	0.56	0.42
	3	1	0.37	0.41
	4	1	0.50	0.42
	5	1	0.57	0.43
	6	1	0.52	0.53
	7	1	0.51	0.46
	8	3	0.30	0.17
	9	1	0.52	0.48
	10	1	0.49	0.50
s2r4t1	1	2	0.38	0.29
	2	3	0.49	0.10
	3	3	0.38	0.10
	4	1	0.42	0.43
	5	1	0.38	0.40

	6	1	0.41	0.32
	7	1	0.42	0.46
	8	1	0.60	0.48
	9	1	0.36	0.41
	10	1	0.49	0.50
s2r4t2	1	1	0.42	0.36
	2	1	0.36	0.38
	3	1	0.49	0.46
	4	1	0.53	0.47
	5	1	0.43	0.35
	6	2	0.44	0.48
	7	1	0.46	0.47
	8	1	0.42	0.39
	9	1	0.43	0.53
	10	1	0.29	0.38
s2r4t3	1	1	0.45	0.46
	2	1	0.58	0.42
	3	1	0.39	0.44
	4	1	0.29	0.25
	5	1	0.52	0.38
	6	1	0.49	0.40
	7	1	0.35	0.44
	8	1	0.41	0.38
	9	1	0.56	0.48
	10	1	0.56	0.40
s2r4t4	1	1	0.55	0.55
	2	1	0.39	0.41
	3	1	0.43	0.45
	4	1	0.46	0.45
	5	1	0.41	0.46
	6	1	0.36	0.30
	7	1	0.26	0.24
	8	1	0.31	0.35
	9	1	0.32	0.33
	10	1	0.35	0.36
s2r4t5	1	1	0.54	0.48
	2	1	0.37	0.37
	3	1	0.58	0.38
	4	1	0.44	0.43
	5	1	0.59	0.57
	6	1	0.41	0.47
	7	1	0.50	0.46
	8	1	0.33	0.34
	9	1	0.47	0.52
	10	1	0.49	0.57

CROP TREES 1994 MEASUREMENTS

Treatment Block	Tree #	Damage Code	R.C.D. (cm)	Height (m)
s1r1t1	1	1	0.76	0.60
	2	1	1.25	1.00
	3	1	1.13	0.73
	4	1	1.24	1.01
	5	1	1.54	0.73
	6	1	1.01	0.72
	7	4	1.15	0.29
	8	0		
	9	1	1.23	0.93
	10	1	1.62	1.03
s1r1t2	1	1	1.69	1.35
	2	1	1.66	1.22
	3	1	0.86	0.82
	4	1	1.63	1.17
	5	1	1.13	0.90
	6	1	1.38	1.01
	7	3	1.21	0.56
	8	1	1.16	1.09
	9	1	0.94	0.67
	10	1	0.94	0.57
s1r1t3	1	1	0.73	0.58
	2	2	0.44	0.16
	3	1	1.64	1.09
	4	1	1.16	0.78
	5	1	1.19	0.61
	6	1	1.14	0.80
	7	3	0.87	0.40
	8	1	1.22	0.69
	9	1	0.82	0.57
	10	1	0.92	0.54
s1r1t4	1	1	0.58	0.58
	2	1	1.09	0.94
	3	1	1.06	1.01
	4	1	0.51	0.54
	5	1	1.23	0.91
	6	1	1.00	0.92
	7	1	1.12	0.91
	8	1	0.64	0.64
	9	1	0.73	0.69
	10	1	0.76	0.73
s1r1t5	1	1	0.92	0.51

	2	1	1.09	0.58
	3	1	1.41	0.88
	4	3	0.96	0.47
	5	0		
	6	1	0.97	0.72
	7	1	1.23	0.97
	8	1	1.47	0.94
	9	1	1.51	1.35
	10	1	1.51	1.34
s1r2t1	1	1	1.19	1.08
	2	1	1.04	0.74
	3	1	1.15	0.53
	4	1	1.58	1.06
	5	1	1.39	0.73
	6	1	1.14	0.89
	7	1	0.78	0.55
	8	1	0.68	0.59
	9	1	0.65	0.45
	10	1	1.13	0.96
s1r2t2	1	1	0.91	0.92
	2	1	1.21	0.97
	3	1	2.24	1.39
	4	1	1.94	1.25
	5	1	2.22	1.48
	6	1	1.16	1.00
	7	1	1.52	1.13
	8	1	0.99	1.06
	9	1	1.11	1.02
	10	1	1.03	1.03
s1r2t3	1	1	2.26	1.54
	2	1	1.40	0.84
	3	1	1.23	0.99
	4	1	0.91	0.56
	5	1	1.21	0.71
	6	2	1.55	0.96
	7	1	1.24	0.99
	8	1	1.13	0.58
	9	1	1.88	1.25
	10	1	2.25	1.14
s1r2t4	1	1	0.56	0.55
	2	1	0.59	1.33
	3	1	1.21	0.95
	4	1	0.73	0.96
	5	1	2.14	1.60
	6	1	1.63	1.19

	7	1	1.25	1.11
	8	1	1.24	1.15
	9	1	1.03	1.07
	10	1	0.93	0.74
s1r2t5	1	1	2.46	1.46
	2	1	1.84	1.23
	3	1	1.23	0.90
	4	1	1.22	0.89
	5	1	1.18	0.96
	6	1	1.62	1.03
	7	0		
	8	3	0.83	0.41
	9	3	1.03	0.56
	10	1	1.57	1.25
s1r3t1	1	1	1.15	0.98
	2	1	1.14	0.67
	3	1	0.46	0.30
	4	1	1.13	0.80
	5	1	0.93	0.78
	6	1	0.84	0.79
	7	4	0.23	0.18
	8	1	1.03	0.89
	9	1	1.46	1.25
	10	1	0.83	0.73
s1r3t2	1	1	1.16	0.94
	2	1	1.43	1.01
	3	1	1.20	1.05
	4	1	1.26	0.96
	5	1	1.76	1.54
	6	1	1.09	0.91
	7	1	0.89	0.54
	8	1	1.37	1.31
	9	1	1.61	1.34
	10	1	1.22	0.97
s1r3t3	1	1	1.53	0.93
	2	1	1.10	0.82
	3	1	1.05	0.68
	4	1	0.93	0.72
	5	2	1.10	0.58
	6	2	0.72	0.28
	7	1	0.95	0.79
	8	1	1.10	0.96
	9	1	0.99	0.92
	10	1	1.26	0.99
s1r3t4	1	1	0.45	0.33

	2	1	1.18	1.26
	3	1	1.00	0.78
	4	1	0.87	0.64
	5	1	0.60	0.67
	6	3	0.52	0.18
	7	1	1.61	1.36
	8	1	0.64	0.66
	9	1	0.72	0.61
	10	1	0.94	0.87
s1r3t5	1	0		
	2	1	1.25	0.84
	3	0		
	4	0		
	5	1	0.76	0.61
	6	1	0.36	0.39
	7	1	1.81	1.53
	8	0		
	9	1	0.54	0.43
	10	1	0.84	0.60
s1r4t1	1	0		
	2	0		
	3	0		
	4	0		
	5	1	1.30	0.92
	6	0		
	7	1	0.38	0.29
	8	1	1.58	1.03
	9	1	0.82	0.57
	10	0		
s1r4t2	1	1	0.67	1.04
	2	1	1.21	1.00
	3	1	1.47	1.25
	4	1	0.77	0.47
	5	1	0.96	0.88
	6	1	1.21	0.92
	7	1	0.71	0.58
	8	1	1.07	0.99
	9	1	0.55	0.52
	10	1	0.71	0.76
s1r4t3	1	1	0.78	0.49
	2	1	0.38	0.38
	3	1	0.52	0.53
	4	1	0.81	0.50
	5	1	1.23	0.69
	6	2	1.25	0.69

	7	0		
	8	0		
	9	1	1.03	0.68
	10	1	1.22	0.53
s1r4t4	1	1	1.12	0.69
	2	1	1.00	0.99
	3	1	0.49	0.43
	4	1	1.24	0.90
	5	1	0.52	0.49
	6	1	1.14	0.86
	7	1	1.28	0.66
	8	1	1.10	0.95
	9	1	0.84	0.87
	10	1	0.82	0.81
s1r4t5	1	1	1.07	0.66
	2	1	1.15	0.73
	3	1	1.46	0.96
	4	0		
	5	1	1.10	0.85
	6	1	1.54	0.93
	7	1	0.82	0.78
	8	1	1.12	0.89
	9	1	1.04	0.81
	10	1	0.72	0.55
s2r1t1	1	1	0.74	0.74
	2	1	0.56	0.42
	3	1	0.71	0.48
	4	1	0.73	0.39
	5	1	0.72	0.61
	6	1	1.01	0.71
	7	1	0.94	0.59
	8	0		
	9			
	10			
s2r1t2	1	1	0.59	0.51
	2	1	0.76	0.72
	3	1	0.62	0.70
	4	1	0.51	0.47
	5	1	0.94	0.66
	6	1	0.88	0.64
	7	1	0.59	0.49
	8	1	0.64	0.60
	9	1	0.65	0.67
	10	1	0.60	0.43
s2r1t3	1	1	1.09	0.69

	2	1	1.13	0.59
	3	1	0.62	0.31
	4	1	0.99	0.65
	5	1	1.13	0.66
	6	1	1.03	0.66
	7	1	0.95	0.52
	8	1	1.30	0.85
	9	1	1.40	0.92
	10	1	0.96	0.52
s2r1t4	1	1	1.06	0.90
	2	1	0.61	0.40
	3	1	0.52	0.46
	4	1	0.73	0.64
	5	1	0.92	0.53
	6	1	0.92	0.76
	7	1	0.71	0.47
	8	1	0.78	0.65
	9	1	0.45	0.35
	10	1	0.96	0.88
s2r1t5	1	1	0.56	0.50
	2	1	0.67	0.49
	3	1	0.87	0.69
	4	1	1.25	0.87
	5	0		
	6	1	0.78	0.49
	7	1	0.66	0.58
	8	1	1.14	0.81
	9	1	1.26	0.77
	10	1	0.79	0.57
s2r2t1	1	1	0.91	0.49
	2	1	1.42	0.85
	3	1	0.66	0.32
	4	1	1.35	0.80
	5	1	1.04	0.68
	6	1	0.60	0.56
	7	1	0.90	0.56
	8	1	1.04	0.79
	9	1	0.91	0.64
	10	1	0.88	0.65
s2r2t2	1	1	0.87	0.72
	2	1	0.64	0.53
	3	1	0.83	0.61
	4	1	0.52	0.55
	5	1	0.76	0.46
	6	1	0.64	0.49

	7	1	0.93	0.67
	8	1	0.73	0.56
	9	1	0.65	0.59
	10	1	0.51	0.49
s2r2t3	1	1	0.96	0.44
	2	1	1.20	0.73
	3	1	0.79	0.63
	4	1	0.55	0.40
	5	1	0.77	0.43
	6	1	0.77	0.44
	7	0		
	8	1	0.58	0.43
	9	1	0.82	0.57
	10	0		
s2r2t4	1	1	0.41	0.40
	2	1	1.06	0.79
	3	1	0.56	0.41
	4	1	0.81	0.62
	5	1	0.57	0.46
	6	1	0.86	0.69
	7	1	0.78	0.45
	8	1	0.97	0.66
	9	1	0.73	0.48
	10	1	0.68	0.40
s2r2t5	1	1	1.04	0.81
	2	1	1.00	0.59
	3	0		
	4	1	0.49	0.44
	5	1	0.49	0.37
	6	1	0.96	0.64
	7	1	0.76	0.43
	8	1	0.53	0.33
	9	1	0.87	0.74
	10	1	0.65	0.50
s2r3t1	1	0		
	2	1	0.60	0.48
	3	1	1.02	0.70
	4	1	0.71	0.64
	5	1	0.98	0.71
	6	1	0.72	0.60
	7	1	0.43	0.39
	8	1	0.67	0.61
	9	1	0.48	0.59
	10	1	0.73	0.56
s2r3t2	1	1	0.55	0.48

	2	1	0.74	0.68
	3	1	1.08	0.95
	4	1	0.95	0.83
	5	1	0.78	0.73
	6	1	0.54	0.52
	7	1	0.72	0.69
	8	1	0.62	0.60
	9	1	0.33	0.39
	10	1	0.84	0.65
s2r3t3	1	1	0.73	0.51
	2	1	0.70	0.50
	3	4	0.70	0.20
	4	1	1.10	0.71
	5	1	0.85	0.65
	6	1	0.52	0.38
	7	1	0.65	0.58
	8	1	0.59	0.49
	9	4	0.38	0.20
	10	1	0.77	0.57
s2r3t4	1	1	0.60	0.62
	2	1	0.64	0.64
	3	1	0.48	0.55
	4	1	0.35	0.39
	5	1	0.47	0.51
	6	0		
	7	0		
	8	0		
	9	3	0.51	0.30
	10	1	0.39	0.44
s2r3t5	1	3	0.86	0.42
	2	1	0.86	0.85
	3	0		
	4	1	1.08	0.75
	5	1	1.05	0.78
	6	1	1.06	0.79
	7	1	0.91	0.70
	8	0		
	9	1	0.93	0.64
	10	1	0.95	0.76
s2r4t1	1	1	0.56	0.45
	2	1	0.96	0.76
	3	1	0.47	0.30
	4	1	0.60	0.62
	5	1	0.53	0.52
	6	1	0.78	0.57

	7	1	0.70	0.63
	8	1	1.22	0.94
	9	0		
	10	1	0.39	0.42
s2r4t2	1	1	0.75	0.63
	2	1	0.57	0.56
	3	1	0.76	0.69
	4	1	0.81	0.68
	5	1	0.81	0.59
	6	1	0.78	0.62
	7	1	0.86	0.76
	8	3	0.72	0.58
	9	1	0.78	0.67
	10	1	0.56	0.65
s2r4t3	1	1	0.67	0.70
	2	1	0.81	0.67
	3	1	0.54	0.57
	4	1	0.62	0.44
	5	1	0.98	0.71
	6	1	0.92	0.56
	7	3	0.48	0.09
	8	1	0.80	0.61
	9	1	0.46	0.41
	10	1	1.05	0.77
s2r4t4	1	1	0.83	0.86
	2	1	0.45	0.59
	3	1	0.56	0.60
	4	1	0.59	0.57
	5	1	0.45	0.46
	6	1	0.42	0.39
	7	0		
	8	1	0.43	0.44
	9	0		
	10	1	0.44	0.44
s2r4t5	1	1	0.97	0.68
	2	1	0.41	0.49
	3	1	0.77	0.48
	4	3	0.54	0.25
	5	1	1.16	0.99
	6	1	0.54	0.62
	7	1	0.76	0.61
	8	1	0.37	0.21
	9	1	0.78	0.78
	10	1	0.79	0.77